SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXIX.—No. 13.
ESTABLISHED 1845.

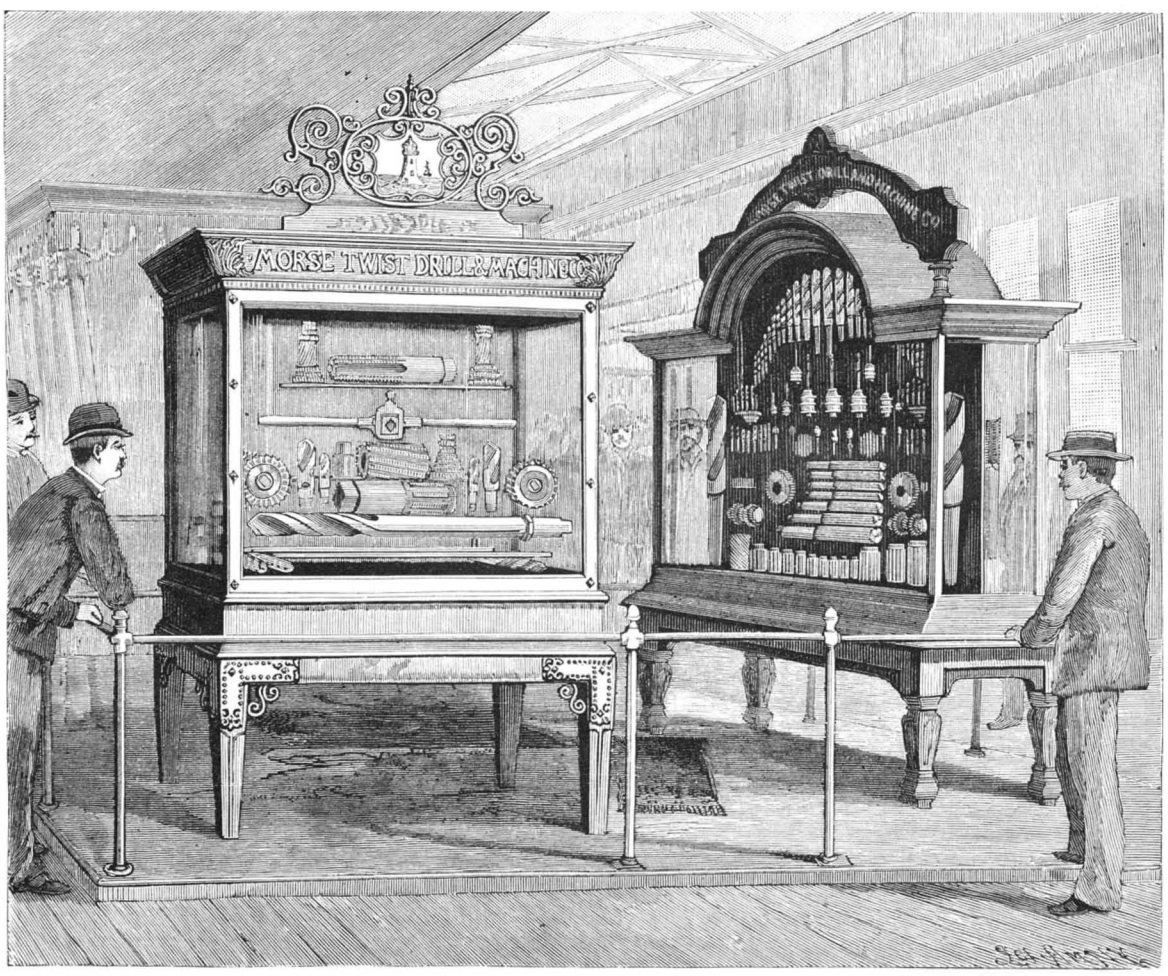
NEW YORK, SEPTEMBER 23, 1893.

$3.00 A YEAR.
WEEKLY.

THE MORSE TWIST DRILL AT THE FAIR

The exhibit of the Morse Twist Drill and Machine Company, New Bedford, Massachusetts, in Machinery Hall, shows twist drills in every conceivable shape, size and variety. There are drills from 0·0135 of an inch in diameter, to use for such delicate purposes as watch work, and from this size they increase until a five inch diameter drill is reached. Such a large drill as this is used for railway brakes and like heavy work. One large drill three and a half inches in diameter is designed for drilling hydraulic cylinders, and because of the peculiar work which this drill is called upon to do, it has a copper tube incased along the twist out of the reach of wear, for the purpose of conveying oil to the drill point. The first case shown in the illustration is made of quartered oak, and ornamented with wrought iron work. In addition to the drills already described, some of which are shown in this case, there is a variety of drills and reamers for special work, and several special designs of shapes of end mills, also grooved chucking reamers, and a special set of drills for drilling deep holes. The second case is made of old San Domingo mahogany finely polished. In this case there is shown mostly the various sizes of drills and chucks, and also a full line of taps and dies. In both cases the exhibits rest on a background of rich black velvet, thus giving the exhibit a fine effect. At the right of the exhibit is a third case containing a full line of practical tools, many of them duplicates of those shown in the other two cases. These tools are open to inspection by visiting machinists and others, and are freely shown by the attendants in charge. The only machine shown by the company is the twist drill grinding machine near this third case. This exhibit is deserving of much praise, more because of what it repre-

(*Continued on p. 199.*)



THE WORLD'S COLUMBIAN EXPOSITION—EXHIBIT OF THE MORSE TWIST DRILL AND MACHINE COMPANY.

GOVERNMENT BUILDING. PALACE OF LIBERAL ARTS AND MANUFACTURES. PALACE OF ELECTRICITY. ADMINISTRATION.

MARINE CASINO. FISHERIES. THE WOODED ISLAND. PALACE OF MINING.

THE WORLD'S COLUMBIAN EXPOSITION—A GENERAL VIEW.—[See page 199.]

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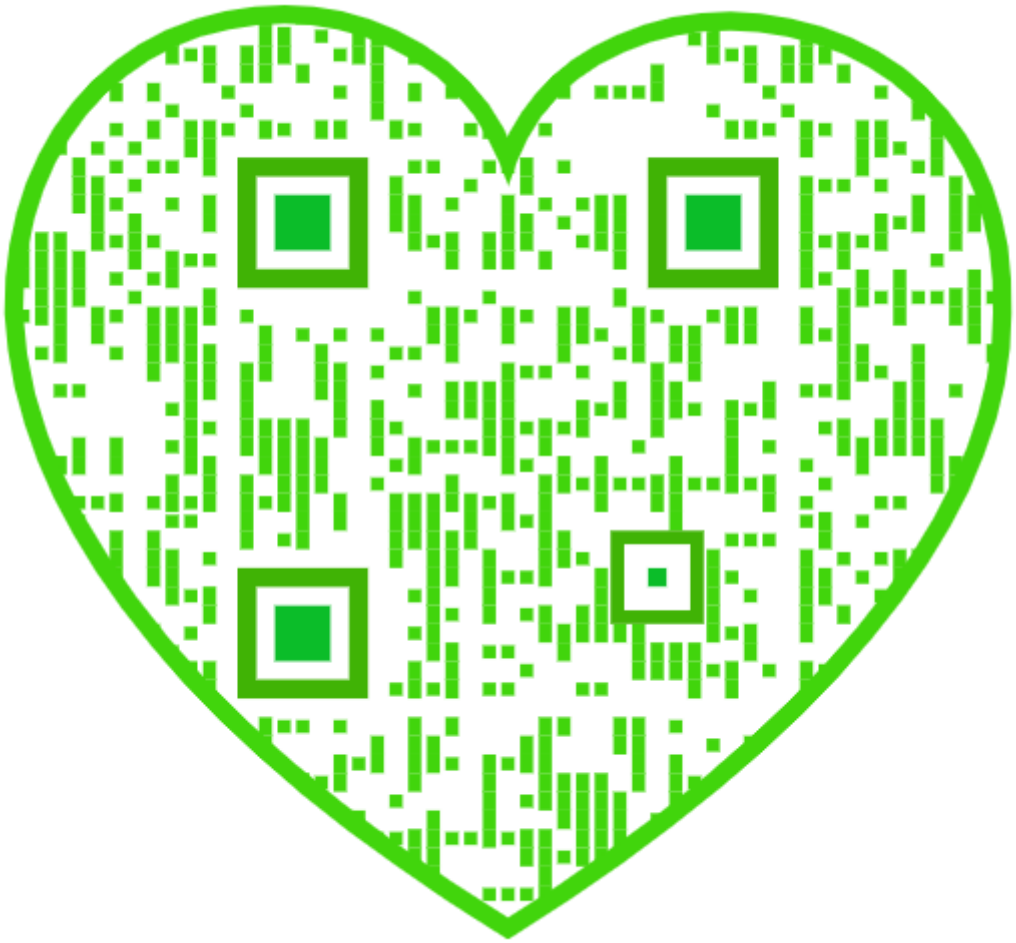

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

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MUNN & CO., Publishers,
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NEW YORK, SATURDAY, SEPTEMBER 23, 1893.

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A NEW PATENT OFFICE BUILDING PROPOSED.

A bill has been introduced in the Senate by the Hon. Mr. Faulkner, providing for the erection, in Washington, of a new building for the Patent Office at a cost, land included, not exceeding three and a half millions of dollars. It is to be fireproof in construction, to be built on the south side of Pennsylvania Avenue, the area of the grounds to be not less than 80,000 square feet, or about two acres. The Secretary of the Interior, the Commissioner of Patents, and the Chief of Engineers, Gen. Casey, are constituted a commission, authorized to make the necessary contracts for the construction, select the plans, and take charge of the work.

The present Patent Office was erected for the special purposes of the bureau, and is sufficiently large for all its needs; but the Patent Office is not allowed to occupy its own building. When the Department of the Interior was created, the new secretary was allowed to occupy rooms in the Patent Office, and to him was given the oversight of that bureau. From year to year the various secretaries have plundered the Patent Office of its rooms, until now the bureau has so little space, its business has so greatly increased, that it is overcrowded in all its parts, and the transaction of business is greatly impeded.

No entreaties of the Commissioners of Patents have availed to induce the Secretaries of the Interior to withdraw from the Patent Office building, and the only recourse appears to be the erection of a new structure. Whether the bill will pass through Congress remains to be seen. But if it does pass, and if a new building is constructed, there is no more certainty the Patent Office will be allowed to occupy or retain it than in the case of the present building. Furthermore, it will be several years before the new structure can be ready for occupancy, and till then the present choked, inadequate and unhealthy quarters must be endured by the examiners and the members of the Patent Office force. We are sorry for them. The present Patent Office is one of the finest edifices in Washington. It is of the Doric order of architecture, 433 feet long, 331 feet wide, 75 feet high. The grounds are more than twice as large as those proposed for the new edifice.

It will be seen by the correspondence in another column that serious damages are being done to the Patent Office models by their removal to another building.

German Production of Zinc.

Germany produces more zinc than any other country in the world; the exportation of zinc is accordingly very heavy, amounting to 28,000 tons, against an importation of not quite 9,000 tons. The main zinc production district is in Upper Silesia, where the metal is made from calamine, and also more and more from zinc blende, by distillation. The smelting of zinc blende has led here, as in other places, to the establishment of very perfect arrangements for utilizing and preventing the deleterious effects of the sulphurous acid generated in the roasting of the ore. In Germany, in 1890, 139,000 tons of zinc were smelted, in which work 9,271 men were employed. The value of the output was 62,000,000 marks ($15,500,000 approx.), of which 64 per cent was produced in Upper Silesia; 20 per cent in the Arnsburg district; and the remainder in the government districts of Dusseldorf and Aachen (Aix-la-Chapelle), and the kingdom of Saxony. The ore in the western parts of the country is in the main zinc blende. The smelting of zinc is made very difficult, in most localities, by the presence of other metals in the ore. However, by a careful preparation of the ores and purification of the zinc obtained, this difficulty has been overcome. By the use of regenerative gas heating furnaces and well adapted condensers the cost of production has been reduced and loss of metal prevented. With the smelting of zinc, a small production of cadmium is connected.—*Kuhlows.*

Mountaineering.

The question of the proper diet for mountaineering is an interesting and important one. Dr. Wilson recommends bread, tinned meats, sardines, jam, cheese, gingerbread, nuts, chocolate, raisins, and dried prunes, and for beverages, cold tea, cold coffee and either red or white wine. On a stiff day's mountaineering it is usual to take five meals—some light refreshment at 2 or 3 a. m. before starting, such as a cup of bouillon or of bread and milk; three meals out of doors, composed of such articles as those enumerated above; and a good dinner on returning in the evening. The writer recommends climbers "to eat as much as possible on the way up" and to drink as little as possible between meals. Drinking glacier water is to be avoided, and on the Swiss mountains it should not be forgotten that many tempting-looking streams will be found to be polluted by cattle, perhaps at some point higher up and out of sight.

Under the heading of "Hints Medical and Surgical" Dr. Wilson gives some simple but sound and valuable advice. Mountain sickness must be combated by frequent halts, and if very obstinate by descending. The sufferer is not likely to be affected more than once in the same season. Snow blindness may be prevented by wearing colored spectacles, and if it occurs, should be treated with a solution of cocaine and chloride of zinc. Sunburn may be prevented by the application of ointments or powders, lanoline and oxide of zinc being especially valuable. Frostbite may be combated by rubbing the affected part with snow and then wrapping it in cotton wool or flannel. Exhaustion may be obviated by small quantities of easily digested food and a glass of champagne. Sprains are best treated by heat to the part and afterward rest. Blisters on the feet may be prevented by soaping the insides of the stockings and rubbing the parts with spirit lotion.

We might pursue this fascinating subject further, but must pause for the present. Mountaineering possesses a curious and unique charm for those who have once felt its attraction. Year by year the same persons return to the same Alpine haunts to find the same charm in peak and pass and valley. "Age cannot wither nor custom stale their infinite variety." Especially to the brain worker is mountaineering to be commended, but let him see that he recognizes and accepts the conditions of the sport, and that he does not mar a most delightful pastime by ignorance or temerity.—*The Lancet.*

Success of the Long-distance Telephone System.

The *Western Electrican* says: The recent storm that swept over the East and South was the cause of much distress to telegraph companies, and, in view of the severity of the storm and the wide latitude which it covered, it is not surprising that communication between different sections of the country should have been temporarily severed. The newspapers were among the principal sufferers, and it was impossible for a time to ascertain the extent of the calamity. The service between New York and Chicago was completely prostrated, and Western papers were unable to obtain news or send dispatches to the East.

The Chicago *Evening Post*, however, hit upon the idea of using the long-distance telephone lines, and three columns of news was received in this manner from the New York representative. It is a subject of congratulation for the telephone company that its wires sustained the strain which practically destroyed the telegraph companies' lines.

Construction is responsible for the endurance of the telephone lines, which are built with a view to resist storms, so that they may always be relied upon. The New York-Chicago line is 950 miles long, and is built in the most substantial manner. The poles are of cedar and chestnut, 35 feet and upward in length and averaging about 45 to the mile, making the total number of poles 42,750. They are braced in every way that will tend to add to their stability. The hard-drawn copper wire used weighs 435 pounds to the mile, and the circuit contains 826,500 pounds of copper, or about four times more than would be used for ordinary telephone service in that distance. The line has been in successful operation since last October. Prior to that time the limit of successful transmission did not exceed 500 miles. Now every principal city between Boston and Milwaukee is included in the system.

At present the company is building south from Chicago to Cincinnati, and an office has just been established at Dayton, O. That the long-distance telephone is a practical success and of exceptional value in emergency cases, or where quick personal communication is desirable, there is no room for doubt.

Ferment of the Pineapple.

Mr. R. H. Chittenden has a paper in the *Transactions* of the Connecticut Academy of Arts and Sciences (1893, p. 281) in which he states that the ripe pineapple contains a very powerful proteid-digesting principle, and that the juice also possesses in a remarkable degree the power of curdling milk. The juice appears to contain three distinct proteids. Two of these are separable from the acid juice by heat alone, one at about 75° C., the other at 100° C., while the third is not coagulable by heat, but is precipitated by acetic acid and potassium ferrocyanide. The proteid-digesting power of the juice is manifested in fluids of all reactions, acid, alkaline, and neutral, the ferment being in this respect a trypsin rather than a pepsin; it acts, however, most strongly in a neutral solution. The proteolytic ferment may be separated from pineapple juice by saturation of the neutralized fluid by sodium chloride or magnesium sulphate, the former being the preferable method. It appears to be a mixture of a globulin and a proteose.

THE Broadway cable cars, New York City, are lighted with ordinary coal gas, instead of petroleum. The gas is first condensed. In the big power house on Sixth Avenue the gas is first run through a condensing engine, which forces it into a boiler-shaped steel receiver. From there it is drawn, as required, through pipes into the car house adjoining on Seventh Avenue, where the holders underneath the cars are charged. Each holder carries enough of the gas to light a car twelve hours.

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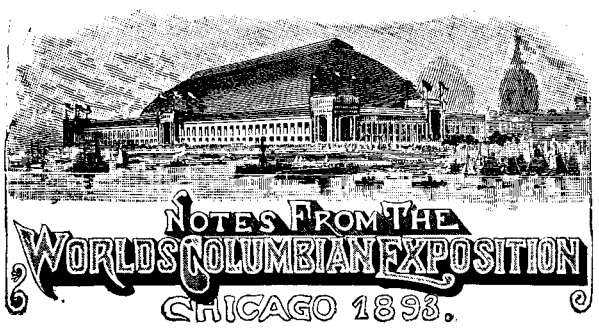

At the extreme south end of the space allotted to the Department of Agriculture in the United States Government building, the visitor at the Fair will find the various exhibits of the Bureau of Animal Industry.

Congress in 1884 passed a resolution providing for the establishment of a bureau in the Department of Agriculture for the purpose of eradicating the contagious and infectious diseases of domesticated animals.

When we consider the vast amount of capital and labor employed in the live stock business of this country, and the amount of good work already done by the bureau, we see the wisdom of Congress in creating the bureau.

The special work done by the bureau, which has been most reaching in its effects upon the stock interests of the country, was the stamping out of contagious pleuro-pneumonia, a bovine disease which first made its appearance in Brooklyn, N. Y., in 1843.

This disease raged with more or less fierceness principally along the lines of cattle transportation till 1889, and in 1891 this work of the bureau was completely crowned with success, when the last case was discovered and suppressed. No new cases having appeared, Secretary Rusk in September, 1892, issued a proclamation declaring the country freed of the plague.

The reports of the bureau are issued annually, in handsome volumes of about 500 pages, and occasionally special reports appear.

It seems to have been Secretary Rusk's object to give the farmer and stockman reading matter which affects his vital interests, for we notice in the collection of reports of this bureau reports upon the "Animal Parasites of Sheep," "Swine Plague," "Hog Cholera," "The Sheep Industry," "Texas Cattle Fever," "Diseases of Cattle and Cattle Feeding," and "Diseases of the Horse." All these reports are prepared under the personal supervision of the able chief of the bureau, Dr. D. E. Salmon, who will be known to future American veterinaries as one of their pioneers.

A notable contribution to the work of the bureau for 1893 is the "Texas Cattle Fever Report" by Drs. Theobald Smith and F. L. Kilborne, two of Dr. Salmon's assistants. This disease has been worked at periodically for about twenty-five years by various scientists without much success. We now know that, according to the views of the above investigators, Texas fever in cattle is carried by the cattle tick; that Southern cattle, or more strictly speaking all cattle which come from a district south of a line established yearly by this bureau, are capable of causing the disease in those cattle with which they come in contact north of the bureau line. The Southern cattle themselves have acquired an immunity to the disease. The cattle tick harbors a microscopic animal parasite. This parasite is inoculated into the Northern cattle by the ticks which come from the Southern cattle. The parasite, a *protozoan* named *Pyrosoma bigeminum*, then enters the blood, disorganizes that essential fluid, and causes the death of the animal.

In the exhibit of the bureau the visitor will notice a model of the Kansas City stock yards. The Kansas River courses through the yards and provides a natural quarantine line between the two yards thus formed. One of these yards is reserved entirely for Southern cattle and the other entirely for Northern cattle.

A small strip of the bureau space is taken up with models of the cattle transportation cars and a fine model of the cattle transport steamer Massachusetts.

On the partition above will be seen photographic views of the interior of the steamer, showing the manner of placing the cattle during the ocean voyage.

The models of the cars show the amount of care which is now taken for the comfort of cattle in transit. The cars are so constructed that both food and drink can be passed to the cattle from the roof the car.

When one enters the department space from the great rotunda, a dressed hog and two sides of beef meet his gaze. Upon inquiry as to the methods used to preserve this meat during this hot weather, the visitor is told that it is not real meat. The demonstrator then takes the visitor into his confidence and tells him that they are *papier mache* models, and that he is looking at the exhibit illustrating part of Uncle Sam's methods of inspecting Chicago pork and beef. At one end of the table he looks into a microscope and sees before him the famous *Trichina spiralis*, a little worm which infests pork, and which sometimes causes the death of persons who swallow them in rare meat. He also sees the various implements used in pork inspection.

In a bottle which rests upon a stand he sees a section of the tongue of a hog which contains numerous little round opaque bodies about the size of bird shot. This, he is told, is measly pork. The name of this little body is a long one—*Cysticercus cellulosæ*. It is the larval stage of one of the most common tape worms, the *Tænia solium*. This larva develops into this worm when we swallow it in rare pork.

On the table will also be seen the various report blanks, the filling out of which constitutes the red tape business which Uncle Sam requires of his meat inspectors.

Passing along the rail which encircles this exhibit, the visitor is guided to the bureau's curio exhibit. Twenty-three hair balls hang before him. If he is not "up" in cattleology, he wonders what a hair ball is. A label just in front of him tells him that they are formed from the hair which cattle swallow after licking themselves, and that the only curious thing about these is that they all were taken from one animal. Now come some of the strangest things yet. The visitor is expected to swallow the story that a sane animal would, with premeditation, swallow such articles as these: Nineteen pounds of stones, a jackknife (the original owner of which has been found), a bridge bolt thirteen inches long and five-eighths of an inch in diameter, a sulky rake tooth four feet eight inches long, miscellaneous articles, such as nails, staples, sticks, stones, buttons, hairpins, pieces of glass, cartridge caps, etc., etc., without end, and finally one of Uncle Sam's depreciated silver dollars and a silver watch chain, both of which are securely wired down to prevent some other animal from swallowing them.

Dick Jones, of Nebraska, says he is making up some lies to tell when he goes back home, and that he will make a careful note not to forget this one.

On the partition in front of him the visitor sees framed photographs of the famous breeds of horses, cattle, dogs and chickens, and also some views of the Chicago stock yards, which are doing duty for a second time at a great international show, they having been used at the Paris Exposition.

Clearing himself of the crowd which has collected, he moves along slowly, looking down into a case containing some toy cattle and tough-looking miniature men. This, he is told, is a model of the cattle pens where cattle which are to be exported are inspected and tagged, and that Uncle Sam knows all about every steer that leaves his domains.

Facing right about, he sees a large number of nice-looking bottles containing worms. Upon close inspection he finds that the contents of the bottles are specimens of the various parasitic worms and insects which are found on or in the domestic animals. He is somewhat bewildered by the long Latin names, but feels sure the collection did not come there by chance; so making himself interested, he listens to the descriptions of the various specimens and is soon convinced that the life histories of the parasites are one of the most wonderful provisions of nature to perpetuate the species. To his left he sees an enormous bottle, and, upon reading the label, he finds that the specimen in the bottle is *Gastrophilus equi*, in the stomach of a horse. When he finds out that man is not infested with such atrocious-looking parasites, that they are nothing but bots and that they do not cause any serious ailment in the horse, he feels much relieved.

The next exhibit is that of a stuffed horse, beautifully executed. The sign under the belly of the horse says "Glanders and Farcy." Upon closer inspection he notices the farcy buds on the hind legs, and the characteristic nasal discharge in this disease. Mental note is made of the fact that glanders and farcy are one and the same disease, and that when man is inoculated from a horse which has the disease in either form he is apt to die.

In a small bottle which hangs near the horse is a fluid substance, reddish in color, which is called mallein.

Mallein is used in diagnosing obscure cases of glanders, and is made in about the same way that Dr. Koch makes his tuberculin, *i. e.*, mallein is a glycerine extract of the sterilized bouillon cultures of the bacterium which causes glanders. Printed directions tell how to use it, and what reactions should occur if the animal has glanders.

Continuing eastward, the visitor stands in front of two long rows of shelves, upon which rest large bottles containing specimens illustrating the pathology of the various infectious and contagious diseases of our animals, such as tuberculosis, swine plague, hog cholera, glanders, actinomycosis or lumpy jaw and contagious pleuro-pneumonia.

The specimens of pleuro-pneumonia are specially valuable now, because this disease is extinct in this country, and their value will increase as time passes.

Turning to the left, he finds that a large terrestrial globe has indicated on its surface the regions in which pleuro-pneumonia now exists in Europe, and the places and dates at which this bovine scourge existed in the United States.

The next exhibit to attract his attention is a horse-shoe-shaped frame hanging on a post.

In this frame are found the identical shoes worn by Nancy Hanks, Maud S. and Sunol when they made their records as trotters. In the same frame are autograph letters from the owners of the above horses attesting the genuineness of the shoes.

After leaving this exhibit, which illustrates the nearest approach of the farrier's art to perfection, the visitor faces a collection of shoes and hoofs which illustrate just the opposite—the imperfect methods of shoeing, and their results to the horse's foot.

This collection illustrates the subject admirably and should be the Mecca of the horseshoer who prides himself on his ideas of right and wrong to his fellow man and his next best friend the horse.

The next exhibit is a large model of the cattle quarantine station at Garfield, N. J. This model shows the relative positions of the various buildings, water supplies, and drainages, and also an enlarged model of one of the cattle hospitals.

Entering the laboratory with the demonstrator, the visitor is shown the various cultures of the bacteria which are investigated by this bureau; also the manner of making cultures, and the various apparatus necessary for bacteriological investigations.

Some slides are placed under a powerful microscope, and, for the first time in his life, the visitor actually sees some little, slender rods, with rounded ends, and he is told that these little, rod-like bodies are the little plant cells called tubercle bacilli, and that it is they that cause tuberculosis, or consumption.

Across the aisle from the laboratory is an exhibit of apparatus which is used in isolating from bacterial cultures the poisonous substances which the bacteria produce. Just as we ourselves produce substances which are poisonous to our tissues by our mere living, so do these little life units, the bacteria, produce substances which are inimical to their own existence as well as that of other plants and animals.

Having seen all the most important exhibits of this bureau, the visitor exchanges cards with the demonstrator, and hurries along to inspect the exhibits of the other bureaus of the department.

The Electrical Engineering Department of the Exposition shows that electric power is made use of in thirty-seven buildings. The Exposition itself uses one hundred and three motors, with an aggregate of 1,811 horse power, exhibitors use 212 motors, aggregating 538 horse power, making altogether 315 motors and 2,349 horse power. This does not include all the electric motors, for a number of exhibitors in the Electricity building have one large motor connected to the Exposition circuit, which operates a number of other motors. The working of all these motors is of value in demonstrating the convenience of electric power. It is evident there will be hereafter a greatly increased demand for electric motors.

One of the novelties among the engines exhibited in the Palace of Mechanic Arts is a 20 horse power steam turbine shown in the Swedish section. It is direct connected to a duplex dynamo which has a rated capacity of two hundred and forty 16 candle power lamps. This turbine when run at full speed makes 22,000 revolutions a minute, but this is reduced ten times before being transmitted to the armatures of the dynamo. The speed-reducing device is at least twice the size of the turbine itself. The ten horse power engine makes 24,000 revolutions a minute. The turbine is of very simple construction and the shaft is a piece of steel scarcely twice the size of an ordinary lead pencil. This makes a shaft that is elastic. Were it larger and more rigid, the turbine could not be operated at such high speed. Since the publication of the articles regarding steam turbines in the SCIENTIFIC AMERICAN SUPPLEMENT, there has been a special interest in this exhibit. The general practice and tendency in the United States in dynamo building is toward a much lower armature speed. But it is claimed for this turbine that the speed can be reduced any desired amount with scarcely any appreciable loss in efficiency.

The concession under which the Ferris wheel was constructed, stipulated that no percentage should be paid until the receipts had reached $300,000, and then the Exposition was to get 50 per cent. The enterprise proves to be a marked commercial and as well as engineering success, and will net the Exposition a daily income of about $5,000 until its close.

Cornelius Vanderbilt and several members of his family spent the first week of September at the Exposition, and occupied their private car, which was switched on a side track in the terminal station. The public seemed to regard the car and its noted occupants as part of the Exposition, and seemed particularly desirous of inspecting both.

Transportation Day was recently celebrated in a peculiar manner. It began with a notable display of aquatic vehicles. There were launches of various types, rowboats, canoes, in fact all kinds of vessels,

(*Continued on page 198.*)

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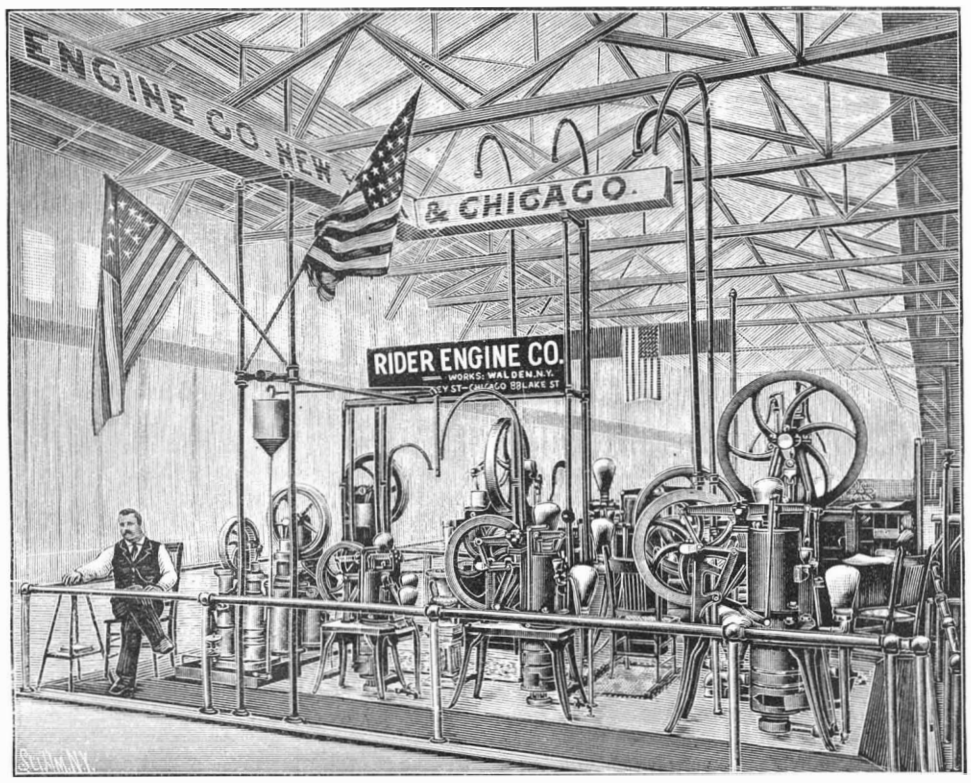
THE RIDER HOT AIR ENGINE COMPANY EXHIBIT.

The largest and the oldest builders in the world of hot air engines, the Rider Engine Company, of New York, have a fine exhibit in Machinery Hall, as shown in our illustration. The company make both the Rider and the Ericsson hot air engines, and they turn out such large numbers of both kinds that their machines are superior in all respects, both as to ability for work and workmanship. During the past five years many improvements have been introduced and the price has been lowered, the manufacturers claiming that this is now the cheapest pumping apparatus in the world which is both serviceable and reliable, its only competitor in the field of domestic pumping being the cumbrous and uncertain windmill. It is supplied with a kerosene-burning attachment if desired, which renders the engine practically automatic.



THE WORLD'S COLUMBIAN EXPOSITION—THE RIDER ENGINE CO. EXHIBIT.

THE EUREKA TEMPERED COPPER CO.'S EXHIBIT.

The exhibit at the World's Columbian Exposition of the Eureka Tempered Copper Co., of North East, Pa., is located in the southwest gallery of the Electrical building. The display is a wonderfully complete one, and seems to embrace nearly everything that it would be thought possible to make of copper or brass. It is shown in an attractive Moorish mosque, of which our illustration represents an exterior and interior view.

This company enjoys a wide reputation for its casting of copper without blowholes and without alloys, and its process of hardening copper, for which it was awarded the John Scott medal by the city of Philadelphia, at the suggestion of the Franklin Institute, in 1891. The company exhibit all sizes and types of commutators for street car and electric lighting. Their exhibit also includes bearings, gears, pinions, trolley wheels, insulated wire, electrical brushes, etc., and the largest assortment of commutator bars to be found in the exhibits. The fact that their product is used exclusively by the Westinghouse people, who furnish power and lighting for the World's Fair, speaks volumes for this metal for electrical work.

This company claim that theirs is the only pure copper cast solid without alloys and without blowholes, and that it has the greatest conductivity of any cast goods, that the original fiber of the copper is not destroyed, and that their castings have a tensile strength of 36,000 pounds to the square inch, and their wire over 80,000 pounds, or nearly double that of any copper offered in the market; that its anti-friction qualities are unequaled, giving it when used in bearings twice the life of any other metal used for the purpose. The company furnishes any goods required for standard dynamos, motors or street car lines, and the goods are warranted to have three times the wear of any other metal for commutator segments, electric brushes, gear pinions, armature bearings, street car bearings or trolleys.

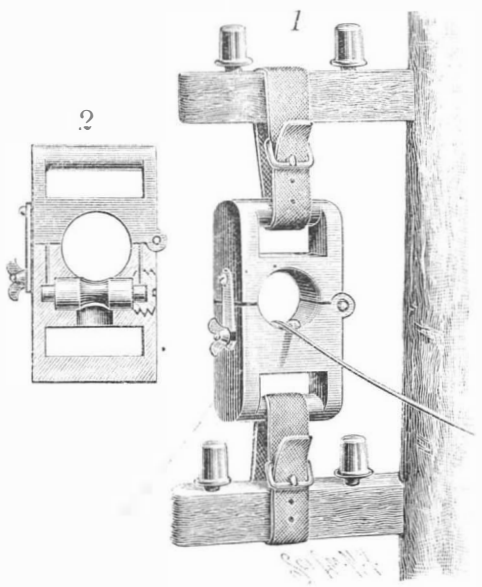
The Decomposition of Steam.

Herr Rosenfeld has devised a very pretty means of illustrating the decomposition of steam by a heated metal, which may make a really pleasing addition to the platform resources of a lecturer on water gas. For the purpose of the experiment, Herr Rosenfeld employs a small quantity of powdered magnesium, introduced into a short length of combustion tube fitted at one end with a stopper and tube for the escape of gas, and connected at the other end with a vessel containing water.

If this vessel is gently heated, while heat is also cautiously applied to the tube containing the magnesium, steam passes over and the metal merely glows—absorbing the oxygen and delivering a steady stream of hydrogen, which can be collected over water. If the evolution of steam is increased, so as to send a rapid current through the tube and over the heated metal, the latter burns with a dazzling light, and the heat soon breaks the tube. Before this can possibly happen, however, and necessarily end the experiment, a good deal of hydrogen will have passed over and been collected in the bell jar. The sequence of operations makes a highly effective lecture experiment.

A GUIDE BLOCK FOR TELEGRAPH WIRES, ETC.

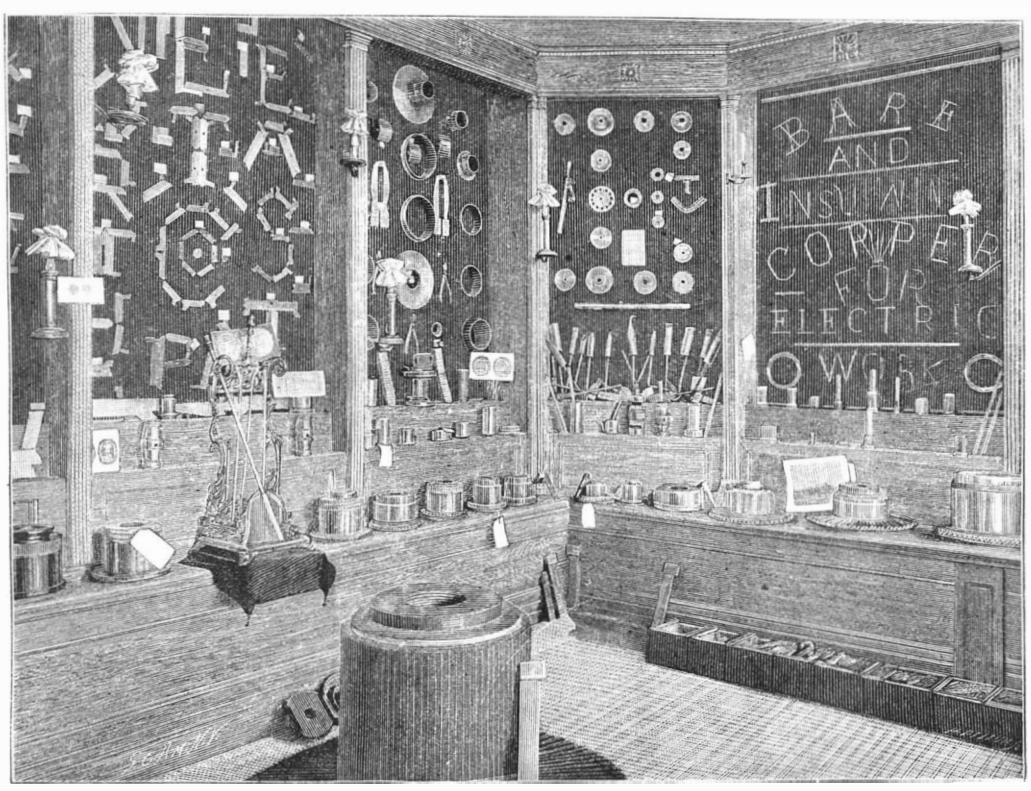
Where wires are to be run or stretched from pole to pole, as in putting up telegraph, electric light, and other wires, the device shown in the illustration is designed to greatly facilitate the work. The improvement has been patented by Mr. Ulysses H. Alexander, of No. 1008 Delaware Avenue, Wilmington, Del. It consists of a block adapted to be conveniently connected with the cross arms of a pole, as shown in Fig. 1, the block consisting of two hinged sections, each having on its inner face recesses which constitute a circular opening when the sections are closed. In the lower wall of the central opening, as shown in the sectional view, Fig. 2, is a cut-away portion adapted to receive a roller, and side recesses, one of which receives one of the trunnions of the roller, while in the other is fitted a screw plug affording a bearing for the other trunnion. The central portion of the roller is concaved, to better guide the wire passed over it, and the roller may be readily changed by removing the plug. For lubricating purposes, oil ducts lead from the upper surface of the lower block section to each of the trunnions. The two sections of the block are preferably locked in closed position by means of a hook and wing nut screwing on a threaded stud, the sections being thus readily opened out for the introduction of the wire or its removal from the central opening.

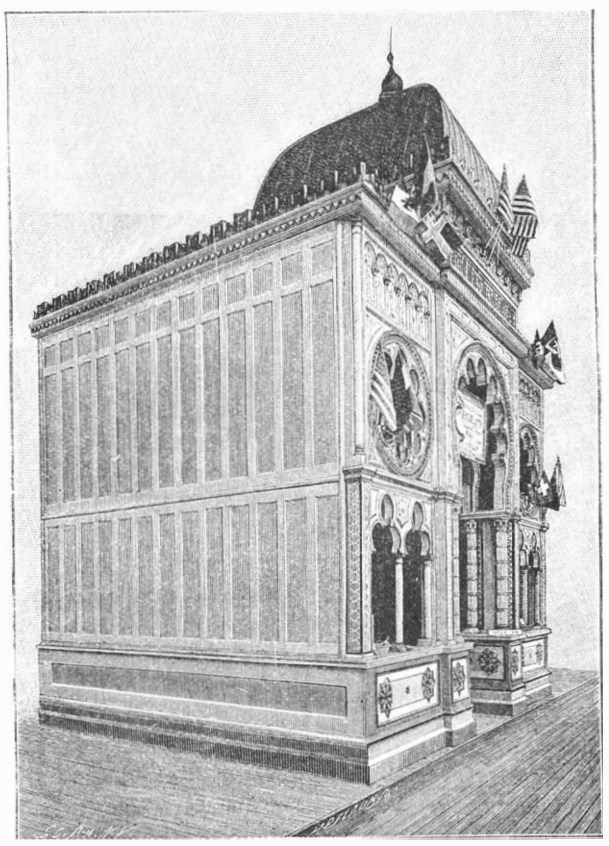


ALEXANDER'S GUIDE BLOCK FOR RUNNING WIRE.

How to Test a Watermelon.

I draw my thumb nail over the melon, scraping off the thin green skin. If the edges of the skin on each side of the scar are left ragged or granulated, and the rind under the scar is smooth, firm, and white, and has something of a glassy appearance, the melon is ripe. But if the edges of the scar are smooth and even, and the thumb nail has dug into the rind in places, and the skin does not come off clean, then the melon is green. You can easily learn on two melons, one ripe, the other green, noting the difference after they have been cut open.—*Southern Farmer.*





THE WORLD'S COLUMBIAN EXPOSITION—THE EUREKA TEMPERED COPPER CO.'S EXHIBIT.

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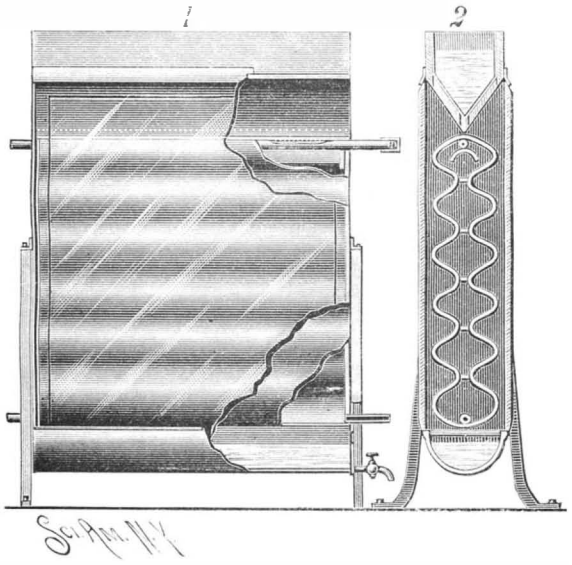
AN INEXPENSIVE AND EFFICIENT MILK COOLER.

According to this improvement, which has been patented by Mr. Frank J. Merz, of Fifth and Lane Streets, Seattle, Washington, the milk is cooled by being passed over the outer surfaces of corrugated metal plates, whose inner sides are kept cool by flowing water. Fig. 1 is a side view of the cooler, portions being broken away to show the interior, and Fig. 2 is a vertical cross section. End plates of the frame support a trough at the bottom and a hopper at the top, there being sockets in the upper side edges of the trough and in flanges of the frame to retain glass plates, which form the side walls of the cooler. Beneath the hopper an interior chamber is formed of corrugated plates of metal, attached at their ends to the end plates of the frame, and the top of this chamber is traversed by a water supply pipe having a series of openings in its top and side portions, over which is located a curved baffle plate or fender to direct the water issuing from the pipe against the side walls of the chamber. The water is thus made to flow along the inner side walls of the corrugated metal plates, passing off from the lower compartment through an outlet pipe. The milk to be

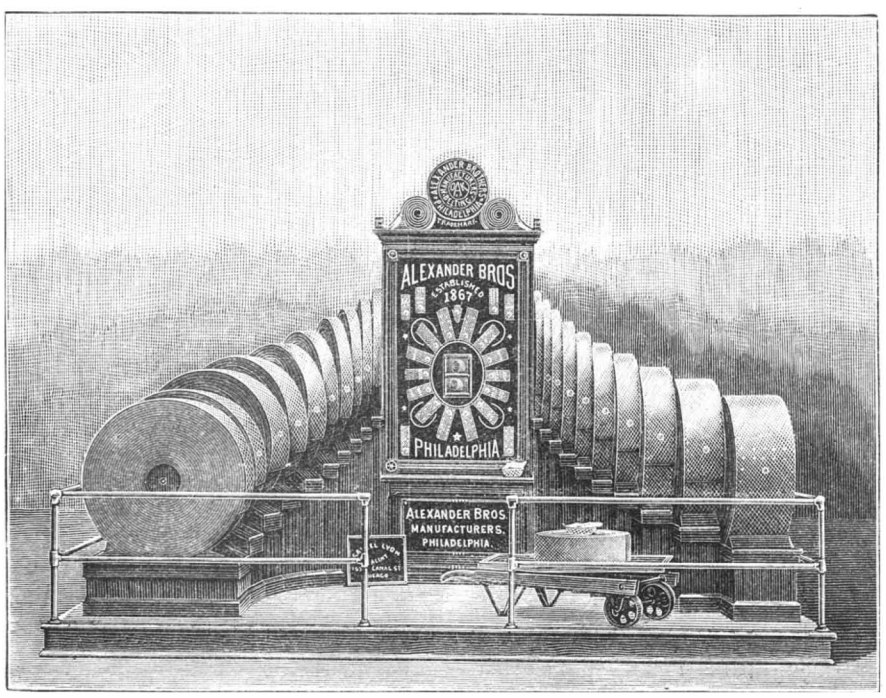


MERZ'S MILK COOLER.

cooled is placed in the hopper, at each side of the bottom of which is a series of holes, while within the hopper is a sieve or strainer entirely covering its bottom. The milk flows down the outer faces of the corrugated side walls of the interior chamber in the same manner that the water follows their inner surfaces, the milk being finally received in the trough at the bottom, where faucets are provided by which the cooled milk may be drawn off.

LEATHER BELTS AT THE FAIR.

One of the very attractive exhibits in Machinery Hall is Alexander Brothers' show of leather belting. It occupies a prominent space on the central aisle, and is in all respects worthy the position. Our illustration gives a good general idea of the arrangement of the twenty large rolls of belting, the display of sample joints, etc., but the beautiful finish of the goods, the fine cabinetwork, etc., of the exhibit must be seen to be fully appreciated. Transparencies illuminated by electric lamps show the great five-ply leather belt made by this firm for the McCullough Iron Company, and a 51 inch three-ply waterproof leather belt, weighing 2,314 lb., which is still in good condition, after a night and day run of four years, at M. & W. H. Nixon's Company's paper mill, Philadelphia, though during that time the belt has been submerged over twenty-five times. A large quantity of belting is shown which for weight and quality, fine finish, and thorough workmanship commands the best trade of the country. It comprises single, double, light double, dynamo double, etc., with all the various kinds of laps and fastenings. This make of belting has a well established reputation for excellence. The factory is located at Nos. 410 and 412 North Third Street, Philadelphia. There is also shown a patent belt truck, the invention of Mr. Samuel Lyon, who is Alexander Brothers' agent, at No. 165 South Canal Street, Chicago. With this truck one man can handle the heaviest roll of any kind of belting, or coils of hose or rope, which can be reeled off or on at will. The exhibit is No. 3, group 69–26 J, 28.



THE WORLD'S COLUMBIAN EXPOSITION—ALEXANDER BROS.' LEATHER BELTS.

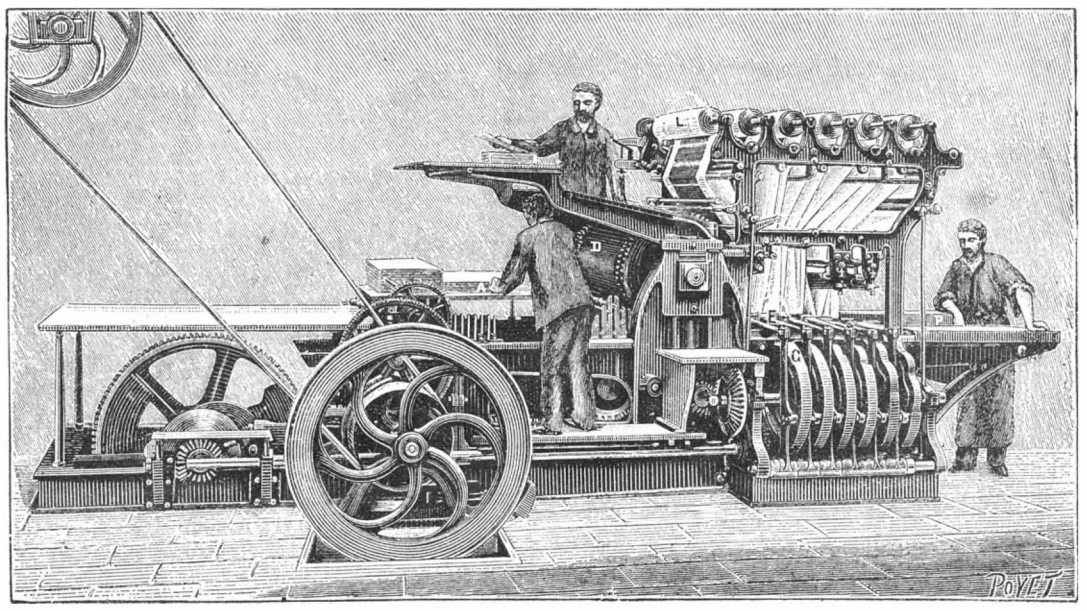
AN INSIDE COVER FOR BARRELS.

A cover for barrels, tierces, etc., to hold meat or other articles under a brine or pickle, is shown herewith, and has been patented by Messrs. John J. Friederichs and Henry C. Fliege, of Calumet, Mich. Upon one side of the cover is a slotted claw-tail piece, the position of which is adjustable, so that it will extend more or less beyond the edge of the cover and be held in place by a thumb screw. Near the other edge of the cover is a standard supporting a pivoted lever having a curved and sharpened outer end and an inner handle end. The dotted lines represent this lever in raised position, as it appears when the cover is being placed in the barrel, the bringing down of the lever causing the claw of the tail piece and the pointed end of the lever to engage the inner surfaces of the barrel. The device is very simple and inexpensive and does away with the necessity of using stones or other sinkers, which may be carelessly brought into service, and where accidental displacement frequently results in the spoiling of the meat.

MECHANICAL PRESS FOR COPPER PLATE PRINTING.

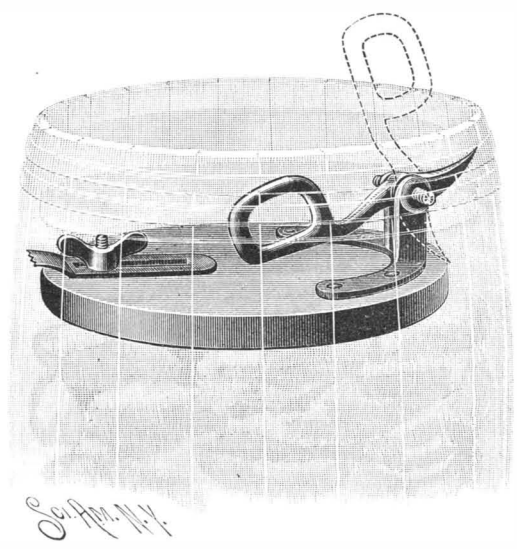
The printing of copper plate engravings requires very particular care that up to the present has not permitted of intrusting the work to a machine, the hand of the workman alone being judged capable of giving the inking and the wiping of the plate the finish necessary for the obtaining of a good proof. As well known, what is called copper plate engraving is done upon plates of copper, either by means of aquafortis or the graver, and sometimes by these two means combined. It is the hollows in the plate that give the black lines, the parts not attacked being reserved for the lights. It is necessary, then, in order to obtain a good proof, to spread the ink very uniformly over the lines of the engraving, to carefully wipe the non-engraved parts and afterward to give a very strong pressure, in order that the paper may take up the ink in the hollows. It will be understood from this very brief description of the operation that this kind of printing can never be done with the text. It will be seen, besides, that if it is done by hand, it will take considerable time and the cost will be very high. That is why, in books, copper plate engravings are always printed outside of the text, and this increases the price of the work.

To succeed in printing along with the text is not to be thought of, since the latter is produced by reliefs. Other processes, such as engraving upon wood, etc., permit of this kind of printing; but what has been long sought for in copper plate engraving is to have the complete work of the printer done by a machine, so as to reduce manual labor. Tentatives have doubtless been made in this direction for a long time. We may mention especially a machine constructed in 1853 by Robert Neale, an Englishman. Many others



PRESS FOR PRINTING COPPER PLATE ENGRAVINGS.

also have sought a solution of the problem, but we cannot find that any have been successful. It was at the Exposition of 1889 that the first machines of this kind were presented that gave satisfactory results. They were devised by Mr. Guy. Since that epoch, however, we have not as yet seen them much employed. One of them is in operation in Berlin and another at St. Petersburg. In France it was judged that they needed some improvements, and they have up to the present been set aside. This was not the way to help to put them to a definitive point. Some months ago Messrs. Endes & Chassepot, copper plate printers, of Paris, had one installed in their printing rooms, and, as practical men, quickly saw what were



FRIEDERICHS & FLIEGE'S INSIDE COVER FOR BARRELS.

the improvements to be introduced into it. They have now succeeded in deriving considerable advantage from it, and very recently we have been enabled to obtain an idea of the services that may be expected from these machines, for Messrs. Endes & Chassepot have in two days delivered the prints of a plate that by the ordinary process would have required nearly a month.

As in all mechanical presses, the machine consists of a table, upon which is fixed the type to be reproduced. This table has a to and fro motion, during which the type is inked in passing under rollers prepared for the purpose and then presents itself under a cylinder, which carries a sheet of paper, and bears strongly against it in order to give the impression. The new and interesting part that constitutes the copper plate press is found toward the right of our engraving. At the upper part are seen rollers, L, each carrying a wound-up band of cloth. The extremity of this band passes under a horizontal rod, F, and afterward winds up under another cylinder not visible in the figure. The rod, E, receives by means of disks, C, provided with cams, a rapid to and fro motion in various directions, so as to produce the effect of the hand wiping with a cloth. These rods, six in number, are provided with flannel tamkins, under which the cloth is constantly renewed, and constitute the rubbers designed to

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clean the plate after it has been inked. The first, L, is charged with the greatest part of the ink in excess, since the five others finish the business, and the last must preserve its cloth almost immaculate. If we suppose the plate properly inked for the first time, the following are the series of operations through which the continuous printing by the machine will be effected. Starting from the point, P, the plate passes under the rubbers, which, at this moment, are raised automatically and do not touch it. It goes under the cylinder, D, which has received a sheet of paper and which prints it at the moment at which the plate is passing beneath it, leaving the printed sheet in the hands of the pressman, while the plate continues on its way. It passes under the inking roller and afterward returns in an opposite direction. This time it passes under the cylinder, D, without touching it and reaches the rubbers, E, which are depressed and perform their office. It then rebegins its course in an opposite direction, and so on.

It is possible with this machine to print from 1,200 to 1,500 copies per day, while by the ordinary process scarcely a hundred can be printed. There is here, then, a real progress that will permit of giving more easily, and without too great an increase of cost, copper plate engravings in books and in journals that publish plates outside the text.—*La Nature.*

Notes from the World's Columbian Exposition.

(*Continued from page 195.*)

from the ordinary scow to the latest improved launch. Venice contributed a state gondola, upholstered and bedecked sumptuously, and rowed by six gondoliers, dressed in mediæval costumes, also ordinary gondolas and fishing boats. Crews of Ottomans manned several distinctive Turkish crafts; half-dressed Dahomeyan natives paddled two curious dugouts; Esquimaux displayed their skill in the use of kayaks; Quacktail Indians, from British Columbia, paddled about in one of their grotesquely decorated dugouts; and there were peculiar fishing boats from Norway, South Sea Island crafts, as well as boats from Ceylon, Java, Egypt, Brazil, Japan, and other corners of the earth.

The feature of the afternoon was a procession of land vehicles which represented nearly every country that has an exhibit in the Transportation building. The procession was headed by Turkish sedan chairs, African palanquins, and other vehicles carried on the shoulders of men. Then followed an array of donkeys and camels harnessed in saddles used in various parts of the world, and carrying loads of different kinds, the several drivers being dressed in their native costumes. The remaining part of the procession comprised several historical vehicles and a long line of carriages of the latest patterns, from phaetons to tally-ho coaches. There was the state carriage of Abraham Lincoln, a vehicle that looks odd now, because of its antiquated design, and which is the worse for wear, as its once beautiful trappings are now badly faded and time-stained, but nothing in the day's observance so stirred the hearts of the multitudes as the appearance of this vehicle. The state carriage of the late Dom Pedro, of Brazil, was also in the procession. A large display of bicycles ended the pageant. This same day was also California Day, and it was observed in characteristic style. In addition to the regulation exercises of speech making, etc., several car loads of fruit were given away. Great stacks of luscious-looking fruit occupied a large part of a lawn at the southeastern corner of the State building, and at the appointed time men endeavored to give it out in small packages to each applicant, but thousands of people jammed into the space, and the crush was so great that, finally, the fruit was distributed any way to get it into the hands of the surging crowd.

The great Schuckert search light, illustrated on the first page of the SCIENTIFIC AMERICAN of September 2, has a formidable American rival, which has just been placed on the colonnade between the Palace of Mechanic Arts and the Agricultural Palace. The reflecting lens is not quite as large as in the German lamp, but is designed to be more powerful. This lamp will require about 200 amperes of current. The upper carbon is 1¼ inches in diameter and 22 inches long, while the lower carbon is the same size, but only 15 inches long. The carbons are set in such relation to each other that the reflector absorbs all the light from the incandescence of the carbons as well as the light of the arc. The lamp is rated at about 100,000 candle power, and its light, when magnified by the reflector, will reach 200,000,000 or so candle power.

Harriet E. Wilson, writing to *Minerals*, tells of some of the minerals to be seen in the Palace of Mining:

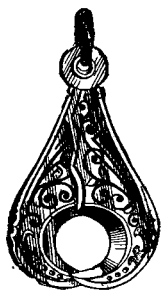
"While looking at the carbonates—calcites and dolomites—I thought: Ah, nature, what art thou not doing! Converting such beautiful things out of limestone. There was a bird's nest with four tiny eggs in it, and a basket with pears and hazel nuts, all incrustated with lime, from Clermont, France, and formed by water flowing down over steps, the spray falling on the objects, and as it evaporates it leaves a deposit of carbonate of lime.

"There was a fine collection of minerals which are used as gems, cut, polished, and in cases. Also imitations of noted diamonds and a case showing the different styles of cutting diamonds. In Mr. Ward's collection are copies of celebrated gold nuggets, the largest of which is the Welcome nugget, found June 11, 1858, at Ballarat, Victoria, Australia, weighing 2,166 ounces, value $41,883.

"In the collection of Mr. A. B. Crim, of Middleville, N. Y., are sections of rock showing cavities containing carbon, calcite, and quartz crystals; quartz crystals doubly terminated; tube containing 1,000 quartz crystals, weight 3¾ grains, 128,000 to the ounce, all from famous Herkimer County.

"Speaking of crystals, every person should visit the crystal cave from the Black Hills, now being exhibited in Horticultural Hall, just under the mountain underneath the dome. The original cave is about twenty miles from Harney Peak. It has been explored fifty-two miles, and the admittance is $1. Here you can see it for nothing, and if you buy $10 worth of specimens or pictures they will give you a ticket admitting you into the cave any time within three years. The entire exhibit is for sale at $50,000.

"Iowa has a coal mine, miner at work, and car loaded with coal: coal value, 1892, $9,800,000; production, 1892, 7,000,000 tons. Model of the Centerville coal mine of Appanoose County. Mantel piece, fireplace, and hearth, with ornaments, made of wave marble; slab unfinished; ores of iron, lead, zinc, or dry bone. A specimen of lead weighs 500 pounds; was at the New Orleans Exposition. Geodes from Keokuk; marble from Warekauase; paper weights and book weights made out of bird's-eye marble, fish-egg, and cat's eye. Mottled stone, color brown and white; variegated sandstone, white and red; glassware made from Iowa sand, white, blue, black, and green. Clays in jars. A monument made of Iowa cement; magnesian limestone, lithographic stone, and yellow sandstone; clays, bricks, and tiles before and after burnt."



A CONVENIENCE FOR SMOKERS.

A neat and quite ornamental little device, designed to serve as a convenience for smokers, is manufactured by Messrs. Enos, Richardson & Co., of Maiden Lane, New York. It is a sterling silver cutter for removing the ends or tips of cigars, before one lights the cigar. As will be seen by the picture, it may be hung on a watch chain, where it will be always ready for use.

The Use of Salicylic Acid as a Preservative.

As the time arrives for the collection of fruits, the question, "How shall we preserve our crop for winter use?" comes up again for consideration. That it is not yet settled to every one's satisfaction is sufficiently evidenced by the number of questions on the subject which appear every autumn in the papers partly or entirely devoted to domestic interests. A variety of plans are suggested for preventing the fermentation or moulding of fruits and preserves. Thus, some lay great stress, in preserving whole fruits, upon the selection of only the soundest material; upon treating it at once; upon heating it, covered with sirup, in glass vessels, etc. Unfortunately, even when all precautions are taken, the result is by no means always satisfactory. Another practice much recommended at one time was that of pouring chloroform over the fruits and hermetically sealing. This plan seemed to answer very well until it was found that the chloroform communicated a curious flavor to some fruits, which no amount of cooking could remove.

Then, with regard to jams, the same difficulty has been experienced. The proneness of these preparations to change is well known, and attempts have been made to minimize it by a number of devices more or less successful.

In salicylic acid, however, we have a ready means of preventing such loss of material and the consequent annoyance and disappointment. In the proportion of 4 to 8 grains per pint or pound, salicylic acid prevents fermentation and the formation of mould in any saccharine liquid. Fruit juices of all kinds, jams, preserves, and the like can be in this manner kept unchanged for years.

Experiments have shown that apple and pear *compote* prepared with only a small quantity of sugar (1 lb. to each 5 lb. of fruit), after ten months, during which time the vessels had been frequently opened and various portions removed, showed no trace of mould or acidity, or of fermentation. Similarly, cherries and blackberries may be preserved with from one-fifteenth to one-tenth their weight of sugar; in the presence of a small proportion of salicylic acid they keep from one year to another with unaltered taste and quality.

With regard to the manner of applying the preservative, it may be added as it is to the jam in the process of preparation. It is advisable to gradually introduce it in the solid state into the boiling mass with constant stirring, or the acid may be rubbed down smooth with a portion of the fruit juice and then added to the whole. In any case the finished product ought not to show any white flocks.

A peculiar method of preserving with salicylic acid is to pour over the cold uncooked fruit the cold salicylated juice of the same fruit, so that the former is entirely covered. The cold salicylated juice is prepared by pressing out the fruit, heating the juice, adding to every pound 15 grains of salicylic acid, and allowing to cool. In this way fruits, such as cherries, plums, etc., can be preserved through the winter uncooked, so that they are suitable for any and every kind of application, even for use in pies.

The advantages of salicylic acid in the preservation of fruits and fruit preserves may therefore be summed up as follows. If properly applied, it is always successful; it does not communicate any unpleasant flavor to the preparations; it is in no way injurious to the consumer, being present only in minute quantities.—*Chem. Tr. Jour.*

Photographic Discovery of Asteroids.

One of the most remarkable of recent astronomical developments is the result of the application of photography to the discovery of asteroids or minor planets.

By the old methods of search the annual rate of discovery ranged from one to twenty, the average for the twenty years, 1872-91, being 10·2. In 1892 twenty-nine were discovered, two only by the older method, while between Jan. 1 and April 15 of the present year twenty-five were picked up by the two observers, Wolf, of Heidelberg, and Charlois, of Nice, who have pressed the camera into service.

The negatives are made with an exposure of from three to five hours, each covering an area two or three degrees square. On the plate the images of the stars are round, clean, while any planets or planetoids which may be present are at once recognized by the elongation of their images due to their orbital motion; and three or four of these oblong lights are sometimes found on a single plate. If the number of observers using this method should be much increased, the number of annual discoveries may easily mount into the hundreds. The total number of these little bodies which circulate in the space between Mars and Jupiter stands at 375 so far as now known, but it is almost certain that those still undiscovered must be counted by the thousand, and obviously it will soon be hopeless to attempt to keep the run of them all.

We may reasonably suppose that all the larger ones have been already discovered and that those still remaining are all extremely minute. It is true that from a certain defensible standpoint the size of a planet has nothing to do with its astronomical importance. Mathematically considered a planetoid's orbit is just as worthy of investigation as that of Jupiter itself, but practically it is plain that the computers will be obliged to select a limited number which present special points of interest and confine their attention to them alone.—*Prof. C. A. Young, in Inter-Ocean.*

Philistine Records of the Hebrew Invasion.

Science contains an interesting account of the Tell-el-Amarna tablets, from the pen of the Rev. Thomas Harrison, of Staplehurst, Kent. These tablets, 320 in number, were discovered by a fellah woman in 1887 among the ruins of the palace of Amenophis IV., known as Kku-en-Aten, between Missieh and Assiout, about 180 miles south of Cairo. They have been found to contain a political correspondence of the very greatest interest, dating from some 3,370 years back. Many are from Palestine, written by princes of the Amorites, Phenicians, Philistines, etc., the burden of almost all being: "Send, I pray thee, chariots and men to keep the city of the King my Lord." Among the enemies against whom help is thus invoked are the *Abiri*, easily recognized as the Hebrews. The date fixes that of the Bible (1 Kings vi. 1) as accurate. Many names occur which are familiar in Scripture, as, for example, Japhia, one of the kings killed by Joshua (Josh. x. 3); Adonizedek, King of Jerusalem (ditto); and Jabin, King of Hazor (Josh. xi.) Very pathetic are the letters of Ribadda, the brave and warlike King of Gebel, whose entreaties for aid are observed to grow gradually less obsequious and more businesslike as his enemies prevailed against him, robbing him eventually of his wife and children, whom he was powerless to protect. But the greatness of Egypt was waning under the nineteenth dynasty; enemies were pressing her at home, and the chariots and the horsemen went not forth.

Cholera a Nitrite Poisoning.

Emmerich and Tsuboi, according to publications in the *Munchener med. Wochenschrift*, come to the conclusion that cholera is a nitrite poisoning, basing their conclusions upon the facts that the cholera bacillus is able to a greater extent than any other bacillus to reduce nitrates to nitrites and the internal administration of nitrites in quantity of 0·5—0·6 gm. is capable of producing very similar physiological effects in man. While other varieties of bacteria are capable of forming nitrites, none of these thrive in the intestines.—*Apotheker Ztg., 1893, 322; Amer. Jour. Pharm.*

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THE MORSE TWIST DRILL AT THE FAIR.

(*Continued from first page.*)

sents in the history of American industries than because of the mere display it makes here. The company has been in existence over thirty years, and during that entire period there has been only one change in the board of directors, and that was because of the death of a member. Mr. Edward S. Taber, president of the company, has been one of its moving spirits for twenty-four years, and there are several foremen and other men holding responsible positions who have been connected with the company over twenty years. This industry is one of the few in the United States that has won such a reputation as to be as well known in distant parts of the world for its products as in its own country. The exhibit is arranged with much taste, with potted tropical plants scattered about. It is in charge of Mr. H. E. Cushman, special representative of this concern.

THE WORLD'S COLUMBIAN EXPOSITION—GENERAL VIEW.

The roof of the Woman's Palace is constantly crowded with visitors who wish to enjoy the superb view there presented to the eye. On a fine day the shining dome of the Administration building dominating all, the huge expanse of roof on the Palace of Manufactures, the waters of the lagoon and the rich green of the Wooded Island all taken together produce a remarkable effect. At the left of our view will be noticed the fine building known as the *Cafe de Marine* or Marine Casino. This building measures 100 × 300 feet and is built in the timbered French Gothic style. The rooms are so arranged that they may be thrown open so that the verandas and dining rooms are practically one. The great specialty of this restaurant is fish. Just beyond this casino is the round angling pavilion of the beautiful Fisheries building, designed by Henry Ives Cobb. This edifice is rectangular in shape, with two circular pavilions connected to the central portion by arcades. The building somewhat resembles the Trocadero at Paris. The details of the ornamentation are very interesting, fish decorations taking the place of conventional ornament. Next is the Government building, reached by crossing either of the bridges shown. Here all branches of the government works are represented by exhibits prepared with the utmost care by the different departments. The manufacture of money and ammunition is illustrated, as well as the curiosities of the Patent Office, a model post office, etc. It is only a step to the great Palace of Manufactures and Liberal Arts. As we have already described this building, we will pass to the Palace of Electricity, which is separated from the Manufactures building by the North canal.

The Palace of Electricity occupies a peculiarly prominent position. More people pass it daily than any other building in the grounds. The main facade has a large hemicycle, with polychromatic decoration, which forms a niche to exhibit the fine statue of Franklin. The dome of the Administration building rises above the Electricity building. This dome is covered with aluminum bronze leaf. The Mines building at the right is rather plain architecturally, but the contained exhibits are of great value and beauty.

In the foreground at the right we have a view of the delightful retreat known as the Wooded Island. A writer in the *Independent* describes it as follows:

"It is situated in the center of the main lagoon, and affords a most delightful semi-sylvan retreat these hot summer days. The island contains sixteen acres, beautifully laid out with walks shaded with trees, and dotted with myriads of beds of beautiful flowers. So large a proportion of the island is given over to the cultivation of flowers that the air is heavy with the fragrance of thousands of specimens of floriculture. Rare species of aquatic plants line the shores of the lagoon, adding to the beauty of the place. The original intention has been wondrously carried out—that of having a 'procession' of flowers in their season. At one time 10,000 rhododendrons were the chief attraction; at another 50,000 roses, including over 2,000 varieties, vied with cacti of bewildering kind and color and shape, some of the latter having trunks as large as saw-logs. Cannas and yuccas by the thousands were also to be seen.

"At the lower end of the island is the famous 'Hunter's Cabin,' which, in its way, is one of the unique exhibits upon the grounds. Just outside the door is the old wagon, or 'prairie schooner,' whose dingy canvas top and generally dilapidated appearance gives abundant evidence of having been familiar with the devious winding mountain roads from Texas, through New Mexico, Colorado and Arkansas to the Black Hills, only to finish out a well-rounded though varied existence in Yellowstone Park. 'The Boone and Crockett Club' invites the visitor inside, where he may feast his eyes upon a typical frontiersman's cabin, even the chinks between the huge logs being filled with mud. The conventional fireplace is here, over which hang snowshoes, hunting implements, deers' antlers, etc. Among the curios presented to view is a pistol, once the property of that pioneer of Kentucky, Daniel Boone, and also a rifle that belonged to Davy Crockett, of 'Be sure your'e right' fame. Both are queer-looking arms, and plainly were veritable 'weapons of destruction' in the hands of their redoubtable owners. Of course, the cabin would not be complete without the usual motley array of revolvers, knives, pipes, army blankets, playing cards, lariats, etc., scattered picturesquely, though with studied negligence, about the place. At the north end of the island are the three Japanese buildings representing the Hoo-den temple, built 840 years ago. These have, with proverbial Oriental generosity, been presented to the city of Chicago, and will be perpetually maintained in Jackson Park as a remembrance of the great Exposition. The architecture is characteristically Japanese, and the interior is artistically decorated by the Tokio Art Academy. The general public is excluded from the buildings, owing to their religious nature; but an occasional glimpse through the latticed sides gives the visitor an excellent idea of the interior of the temple."

Peach Fever.

"Peach fever," an occupational disease, not infrequently seen among the employes in the fruit packing and canning establishments of Maryland and Delaware, is the subject of a paper by Dr. C. L. Anderson, of Hagerstown, Md., in a recent number of the *Maryland Medical Journal.* Dr. Anderson divides the cases into two varieties: First, the psychotic variety, marked by mental exaltation, ideas of grandeur, seen in persons having a lively imaginative faculty; second, the true peach fever, caused by contact with the fruit in the course of its being picked and packed for market. This variety is defined as "a morbid condition of the respiratory and cutaneous surfaces, with some consequent systemic disturbances, due to irritation from the pubescence of the skin of the common peach—the *Amygdalus persica.*" The Schneiderian membrane first becomes irritated and tumefied, and yields a large flow of serum and mucus. The frontal sinuses, the conjunctivæ, and the larger bronchi may take on, by extension, the same kind of disturbance; cough and asthma may be excited in susceptible subjects. On the skin, the chief display of this amygdaline inflammation will be found about the wrists, forearms, neck, and forehead. It commonly begins and ends in a macular or papular eruption, but it may go on to a true dermatitis and to pustulation. The febrile rise may be as high as two degrees, which may be taken to indicate the amount of systemic discomfort induced by the respiratory and cutaneous irritation. Thin-skinned and neurotic young women suffer more and longer than the pachydermatous men and the older women. The more experienced workers seem to become proof against the irritant after some years in the business. There is no evidence to show that the disorder is contagious.

The Requisites of a Good Rubber Tire.

The envelope must be strong enough to stand a pressure of sixty pounds to the square inch, and at the same time of such lightness as to allow the air in conjunction with it to act as a perfect cushion. It should be impenetrable, or provision should be made for closing punctures—requirements difficult to meet. In the self-healing sorts now rapidly coming into favor it will be found that great care will have to be used in the vulcanization, or as age comes along to the tire an over-cure or an under-cure will rob the tire of its self-closure.

The tire must be perfectly flexible and elastic longitudinally to secure easy depression of the tread and to return the part after depression. It must not be so elastic, however, as to allow an obstruction in the road to drive the tread of the tire to the rim of the wheel; neither must it be so much that the depression will cause the rider to be constantly working against an "up hill," as is so conspicuous in the ordinary cushion tire; otherwise the factor of speed will not exist. There must be a maximum of air and a minimum of rubber and fabric. Then the fastenings should not be complex, and repairs should not be beyond the knowledge of the amateur—quite the reverse of what is now the case, as repairs are generally beyond the capacity of the ordinary repair shop.

To obtain such a tire there is much in the rubber and more in the fabric. The first is a known quantity—certain compounds will bring certain results; but the list of fabrics to use with it is very long and the great improvement will come with further invention and the investigation of a wide field of possibilities. The special material or materials will have to be found that are the best for the purpose, and then will come a special weave of them.

A discrimination will have to be made between the "racer" and the road tire; the maximum degree of softness and lightness of weight used in the former will not be allowable in the latter. The tire business is now in its infancy, and a want of competition is not conducive to rapid strides toward the ideal one. Later on the field will be a remunerative one to the inventor who can stand head and shoulders above those who have gone before him.—*India Rubber World.*

Damaging Removal of Models from the Patent Office.

A correspondent in Washington writes us as follows: It being necessary to provide in the Patent Office building more space for the working forces of the Land and Patent Offices, the present Secretary of the Interior, Hon. Hoke Smith, appointed a commission to investigate and report upon the matter. The idea of removing 227 cases of models to another building originated, however, with the Assistant Secretary of the Interior, Governor Sims. A contract was made with Messrs. White and Freeman, to effect the transfer to the Union building on G Street, a little over a half square from the Patent Office, at the rate of $15 per case, or the gross sum of $3,075. But 205 cases have been removed, since there is not space (on the third and fourth floors) in the Union building to receive them. A large portion of the models—estimated at 10,000—belonging in those 205 cases have not been removed, but still lie in heaps upon the floors of the Patent Office model halls. It is asserted with every show of probability that the contractors have lost considerably on the job. That they were incompetent for it, and their hired help still more so, has been the observation of all who have watched the course of procedure. The models were handled like blocks of wood, being thrown hither and thither, and piled one upon another in rough dry goods boxes or whatever other receptacles were available. Often they were dumped like corn or potatoes, regardless of consequences. Even now one may see them in heaps where further injury is inevitable, and in boxes many deep, where delicate parts or connections are sure of breakage in most instances. The wood and iron frame glass cases were treated no better. All have been injured, some badly. The doors of the iron frame cases that have been set up in the new place do not fit, and hardly one is or can be locked. The negroes and other "hands" who moved the cases and models were wholly unused to do so delicate work, and also unfitted for it, and the results might have been easily predicted.

Now, one part of the models and model cases remain in the Patent Office and the other part in a leased building, where the natural light is, in many places, utterly inadequate, and where no artificial light has, as yet, been provided.

In the North Model Hall the main floor and one side of the first gallery is clear. In the South Hall the floor only is clear. The entire East Hall is clear. Of the space thus available, the Patent Office will get very little, the lion's share being given to the Land Office, which is, and has long been, the pet of the Secretaries of the Interior. Few secretaries have come from sections of the country where they could have acquired much knowledge of or interest in patents or the patent system.

It is not probable that even those who pushed this scheme to the present condition now approve it. The transfer of clerks from the Land Office to the Union building could have been effected with small cost and little labor compared with what this plan has involved, and the Patent Office would have been left in some sort of attractive condition. The question of keeping the models together aside, nothing could be architecturally more repulsive than the building of cheap wooden cages, called rooms, between the white marble columns of the East Hall or the more ornate columns of the North Hall. They look more like cattle stalls or merchandise booths at a county fair than anything else.

The whole thing cannot be characterized as less than a disgrace to the Department of the Interior, which conceived and initiated and is still engaged in carrying it out.

The Treatment of Alopecia with Essence of Wintergreen.

Hallopeau (*Annales de Dermatologie et de Syphiligraphie*, vol. iv., 1893) has made some experiments as regards the value of the essence of wintergreen in the treatment of alopecia. In one case six patches were found on one side of the head, which had been treated with tincture of cinnamon and had not improved.

After one month three of these were treated with essence of wintergreen, while the remaining three were treated daily with frictions with the essence of cinnamon with four parts of ether.

As a result of this observation the patches treated with the wintergreen healed immediately, while those treated with the cinnamon showed no signs of improving.

In applying the wintergreen it may be mixed with an equal part of ether or one part of vaseline to five of the essence.

The ethereal solution is very active and is rather to be preferred.

When used it is to be thoroughly rubbed in the diseased part and applied once daily.

Its beneficial effects result from its producing an inflammation of the integument and transforming it into an unfavorable medium for the growth of parasites. The application is not painful.

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JEAN MARTIN CHARCOT.

The life of the great Charcot came to an end unexpectedly, while he was temporarily staying at Morvan, about the middle of August, says the New York *Medical Journal*. Bourneville, a former pupil and colleague of Charcot's, writes in his journal, *Le Progres Medical*, that "death came on suddenly to the great master, and nothing had occurred to enable his friends to forecast such an event." Recent visitors to his clinique at the Salpetriere had not failed to notice a loss of muscular vigor, a shambling gait at times, and a suggestion was awakened in the minds of many that the nervous and muscular apparatus of the great teacher were no longer so well attuned to one another as formerly. His vigor of mind and intentness of interest in scientific subjects were, however, in no wise abated.

The artistic element in Charcot's character was strong, and, with the qualities he possessed for acute observation and crisp description, helped him to place neurology on the high plane that it occupies to-day. Of his power as an observer or clinician, an editorial writer in the *Lancet* has said: "He is worthy to rank with Trousseau and Laennec." As a delineator or "word painter" he excelled. From the time of his early thesis on chronic pneumonia, about 1860, until his late psychological studies—for during recent years he has been concerned with those subjects rather than with his former problems in neurology—he has had no equal in graphic teaching. His artistic faculty found expression in the *Nouvelle iconographie de la Salpetriere*, in *Les demoniaques dans l'art*—by himself with the artist Richer—and in the collection of illustrations adorning the walls of his consulting rooms. These illustrations have for their chief theme the ancient conception of hysterical or epileptic "possession," an imaginative conception largely, on the part of the various artists, but based on facts. Charcot was on the *qui vive* for illustrations in the neurological field, and few teachers have availed themselves more fully than he of the improved processes of photography and other graphic methods. Charcot was great as a pathologist, and he was not hindered by the advance of years from continuing his work in that direction. He was a man of wide general attainments, interested in the sciences outside of medicine, and conversant with the literature of other countries as well as his own. His linguistic attainments were remarkable, as has been demonstrated at many a congress in England and on the Continent. His voice will be greatly missed at the Roman Congress in 1894.

In conclusion, to quote again from Bourneville, "Science has lost in Charcot one of her most eminent and most noble representatives; France has lost one of those men who brought her added honor and contributed to her greater reputation throughout the whole world." Charcot was born in Paris in 1825; he was, therefore, not more than sixty-eight years old at the time of his decease. The list of his contributions to medical literature is too great to be enumerated here. He was a member of the Institute of France and of many other societies in his own country and in others.

L'Illustration, to which we are indebted for the accompanying cut, says:

Charcot was elected to the Academy of Medicine in 1873, ten years before entering the Academy of Sciences. During this interval the chair of clinic of nervous diseases was established for him. It is impossible, in a short article, to enumerate the vast amount of scientific work that Prof. Charcot left behind him. It is not too much to say that Prof. Charcot discovered the various laws and peculiarities and has made a classification of all the diseases and ailments of the nerves and marrow. He made a most profound study of and practically created that new classification in pathology popularly known as locomotor ataxia, aphasia, illusion, and nervous disorders of a high grade. This celebrated savant, with Cæsarian profile, bright eye, strong lip, and genial expression, brought about him a group of scientists known as the school of Salpetriere, which has flourished, developed, and spread out until it has added permanent distinction to the scientific reputation of the French nation.

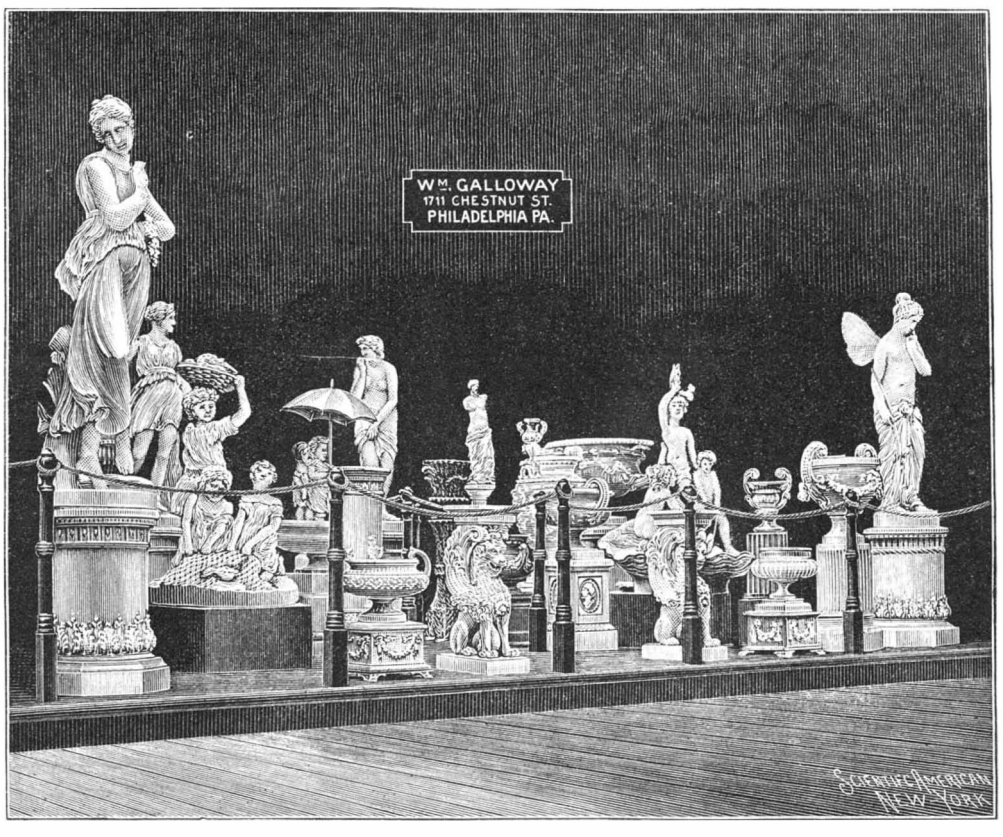
PROFESSOR CHARCOT.

Bacteria and Colds.

According to the Berlin correspondent of the *Lancet*, Professor Schenk has found that micro-organisms move toward warm points. This movement he terms thermotaxis, and he concludes as the result of experiments with a specially constructed apparatus that warmth acts as a stimulant on micro-organisms, which move toward a warm body in their neighborhood, and that this thermotaxis is a vital property of bacteria. The professor further considers that in certain cases of "catching cold" an infection is conveyed by bacteria. Thus a person entering a cold room would attract the bacteria present by his warm body, and these, finding admission through the skin or otherwise, produce, after a certain time of incubation, the results ordinarily attributed to "catching cold." The hair bulb sheaths, sweat glands, and mucous membranes are all said to offer possible points of entry to bacteria.

WILLIAM GALLOWAY'S EXHIBIT OF ART POTTERY.

The art pottery and terra cotta exhibit of William Galloway, of 1711 Chestnut Street, Philadelphia, in the Manufactures building of the World's Columbian Exposition, affords a strikingly beautiful exemplification of the perfection to which this class of work has been brought. This pottery was established in 1810, and makes a specialty of statuary work, fountains, garden vases, flower boxs, jardiniers, and architectural and decorative terra cotta. The figure at the right in our illustration showing the exhibit is a representation of Gibson's Psyche, while that at the left of the picture is the "Dancing Girl," by Canova; the "Turtle Catchers," by Ferd. Mersemann, and "The Fishers," by Carl Storck, forming two of the many intervening pieces. A very good idea of the variety and high artistic character of the work made at this establishment, including reproductions of Egyptian, Greek, and Etruscan vases, and statues modeled after the work of the most famous sculptors, may be obtained from the illustrated catalogues, which are mailed free on application. The exhibit received the first award of its class.



THE WORLD'S COLUMBIAN EXPOSITION.—ART POTTERY AND TERRA COTTA EXHIBIT.

Dynamite Rain Making.

Another experiment in rain making in New England was recently tried at Bloomfield Conn., when several half-pound dynamite cartridges were sent up attached to fire balloons. The New York *Tribune* says the tobacco growers had gathered in large numbers, hoping for the salvation of the tobacco crop, already badly damaged by the intense heat and the drought.

A wire was tied to the cartridge and tied to the bottom of the balloon. Attached to the cartridge was a fulminate cap, and to this a fuse a little over six feet in length, regulated to burn three feet each minute. The light was touched to the end of the fuse and the balloon released. It sailed upward, and the dangling fuse began to leave behind a trail of smoke. It rose until at the end of two and a quarter minutes the red and white sphere changed instantly into a cloud of black smoke. The spectators saw the balloon shattered and two seconds later heard a terrific report. Mr. Chappel said the balloon was about 4,000 feet high when the cartridge exploded. A second balloon was sent up. A longer fuse was used, and four and a half minutes after the balloon had been released the cartridge exploded at an altitude of about 6,000 feet.

The third cartridge sent up was as big a success as the ones before it, and orders were given to the experts to send up the remainder of the fifty balloons and cartridges as quickly in succession as possible. The next balloon was prepared and released. It rose a dozen feet, when it was caught in a current of air and sagged. The paper near the base took fire, and in a moment the balloon began to descend, while the flames began to envelop it from bottom to top.

The mass of fire with a dynamite cartridge dangling from it created a panic and scattered the crowd in all directions. The long fuse kept eating its way toward the bomb, and it would be at least four minutes before the cartridge would be touched off in the regular way, but there was danger that the fire from the balloon would ignite the fuse close to the cartridge. Mr. Stevens and Mr. Chappel kept their wits about them, and as soon as the fuse could be reached tore the cartridge from the flames, and the balloon sank to the ground a crumpled mass. It was decided that it would be too risky to have a repetition of the accident, with people standing around in danger, and the experiments were cut short.

Fuel of Steamers.

The American liners New York and Paris burn about 330 tons of coal per day, or about 30,800 pounds per hour, and maintain about 18,000 indicated horse power, which is equivalent to a coal consumption of 1·71 pounds per hour per horse power. The average for all the fast ships with triple expansion engines, like the New York, Paris, Majestic, Teutonic, and Furst Bismarck, is probably only about 1·75 pounds per horse power hour. In the case of the Umbria and Etruria and similar ships, which have only compound engines, the rate is higher. For example, the Etruria burns as much coal as the New York and more than the Teutonic and develops far less power than either of them, which illustrates the great advance made in marine engineering by the introduction of the triple expansion system.

ONE of the first tunnels in the United States was on the Alleghany Portage Railroad in Pennsylvania. It was nine hundred feet in length and was finished in 1831.

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WILLIAM HARKNESS.

BY MARCUS BENJAMIN, PH.D.

Each year, as the summer closes and autumn begins, the American Association for the Advancement of Science holds its annual meeting. A sketch of its president has been a characteristic feature in the issue of the SCIENTIFIC AMERICAN for the week during which the meeting is held. This practice began in 1887, with an account of the work of Edward S. Morse, and among the biographies published have been those of Langley, Powell, Mendenhall, Goodale, Prescott and Le Conte—first a specialist in the natural sciences, and then one in the physical sciences, in regular alternation.

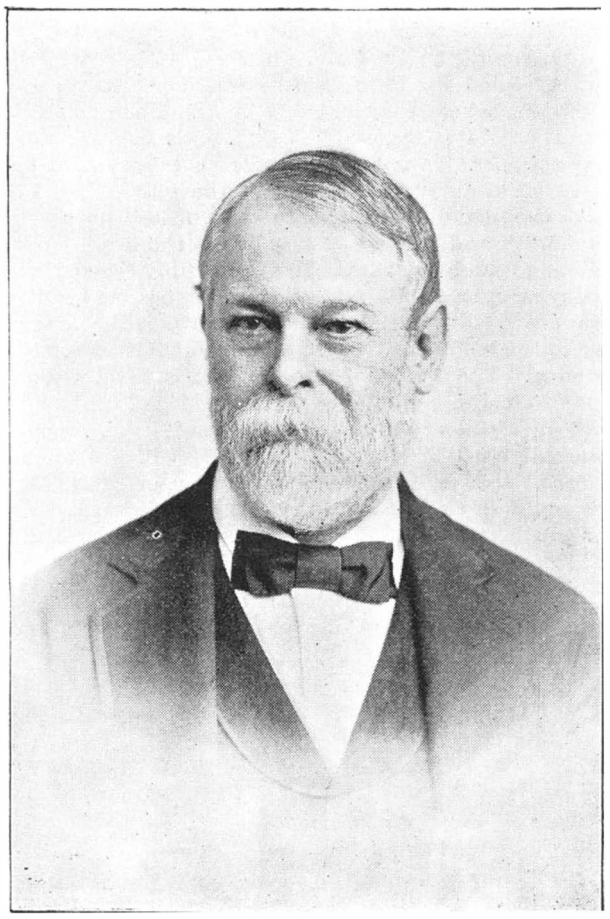
At Rochester, last summer, the association chose William Harkness to the office of president, and at the meeting recently held at Madison he was inducted into office. This selection was most happy, for not only was the honor worthily bestowed on one of the best known scientists in the association, but the courtesies received from the city of Rochester were recognized in thus naming a president who had spent part of his early life there, and had studied at its university. Prof. Harkness was born on December 17, 1837, in Ecclefechan, Scotland, where his father, James Harkness, was pastor of the Presbyterian church. He was not destined to remain long in his native land, for in 1839 his father came to the United States and held pastorates in various places, including New York City.

Not the least among the usual advantages of a clergyman's son is a good education, and in September, 1854, young Harkness entered Lafayette College. He continued there for two years, and on the removal of his father to Rochester, he entered the university there and was graduated in 1858. Choosing medicine as his profession, he studied that science in New York City, and received the degree of M.D. in 1862. Notwithstanding this preparation, Prof. Harkness seems to have turned his attention to other things, and his medical career closed with a brief service during the second battle of Bull Run, in 1862, and an equally brief one during the threatened attack on Washington, D. C., in July, 1864.

However, he entered the service of the government, and in August, 1862, was appointed aide at the Naval Observatory in Washington. A year later he was commissioned professor of mathematics in the U. S. navy, with the relative rank of lieutenant commander, and continued at the Naval Observatory. During 1865–66 he made an extensive cruise on the Monadnock, visiting the principal ports in South America, and conducted an elaborate series of observations on terrestrial magnetism. His results were published in 1872 by the Smithsonian Institution, under the title of "Observations on Terrestrial Magnetism, and on the Deviations of the Compasses of the United States Ironclad Monadnock during her Cruise from Philadelphia to San Francisco, in 1865 and 1866."

On his return from the trip he was attached to the United States Hydrographic Office, where he remained for a year, and in 1868 again returned to the Naval Observatory, remaining there until 1874. Meanwhile in 1872 he had been advanced to the relative rank of commander. He observed the total eclipse of the sun from Des Moines, Iowa, on August 7, 1869, and at that time distinguished himself by the discovery of the 1474 line of the solar corona.

In 1871 Prof. Harkness was appointed a member of the United States Transit of Venus Commission, created by Congress, and after designing most of the instruments to be used he went to Hobart Town, Tasmania, as chief of the party that observed the transit there. He then returned to Washington, having made a trip around the world, and in 1878 was advanced to the relative rank of captain. In 1882 he was made executive officer of the Transit of Venus Commission, and given charge of the fitting out of all the parties organized at that time. Four of these took observations in the United States and four were sent respectively to Patagonia, the Cape of Good Hope, New Zealand, and Chile. A specialty was made of observing the transit by the photographic method. This fact is pertinent when it is remembered that in 1874 all the great nations who sent out parties had adopted that method; but when they came to measure and reduce their photographs they encountered unexpected difficulties, which proved so serious that the Astronomer Royal of England, Sir George B. Airy, admitted publicly his inability to surmount them, and the German commission also abandoned the attempt to reduce their photographs.



WILLIAM HARKNESS.

At a meeting of European astronomers, held to consider these facts, it was decided that the photographic method had proved a failure in 1874, and, therefore, it was inadvisable to try it again in 1882. In the face of this decision only the American and French astronomers made photographs in 1882.

On the return of the American parties, Prof. Harkness was given charge of the work of reducing all their observations, among which were many hundred photographs. For the reduction of these pictures, which was altogether a new problem in astronomy, Prof. Harkness had to modify old methods and also to devise many new methods, while in actual time nearly eight years were consumed in the work. Concerning his feelings at this time he has written: "You can imagine my anxiety during all these years when I tell you that Congress had appropriated a definite amount of money for the work, and if I had made a slip anywhere I might not have detected it till the job was finished, and then I would have had no money to pay for correcting it. I literally lay awake nights devising all sorts of checks to prevent the occurrence of such an accident. However, fortune favored me and I succeeded in bringing the work to a most successful conclusion." Prof. Harkness finished this work in July, 1890, and, in addition to the great value of the information, it was a source of gratification to American scientists to recognize the fact that one of their own number had accomplished that which the most eminent of English and German astronomers had abandoned as impracticable.

The specialty in which Prof. Harkness is best known has already been indicated as mathematical astronomy, but he also has gained reputation in the application of mechanics to astronomy. The machine used for measuring the astronomical photographs obtained in the transit of Venus expeditions were designed by him, and a duplicate has since been made for Lick Observatory, California. It consists of a pair of indicators which always show the exact point in the heavens toward which the telescope is directed. These indicators are arranged upon one or two dials, as may be most convenient, and face the observer, at the height of his eye, when he is in position to manipulate the telescope by means of its quick-motion wheels or ropes. By this means the work of the observer will be greatly facilitated, and it has been adopted in other observatories.

Another invention of importance made by him is that of the spherometer calipers, which is the most accurate instrument known for measuring the inequalities of the pivots of astronomical instruments.

The degree of A.M. was conferred on him by Lafayette College in 1865, and in 1874 the University of Rochester gave him the degree of LL.D. He has long been a member of numerous scientific societies both in this country and abroad, to whose proceedings he has been a regular and valued contributor. He joined the American Association for the Advancement of Science at the Nashville meeting in 1877, and a year later was advanced to the grade of fellow. In 1881 he was called to the temporary occupancy of the vice-presidency of the section of mathematics, physics, and chemistry, and he was elected to the full possession of that place for 1882; also, in 1885, he again presided over the section during the absence of the regularly elected officer. The successful fulfillment of his duties in these connections, and his high scientific attainments, soon made him a candidate for the presidency. His modesty led him to refuse that honor, but at Rochester, at a meeting from which he was absent, he was elected to the place which he so abundantly deserves.

The association is certainly fortunate in having at its head a scientist of such eminent and varied attainments.

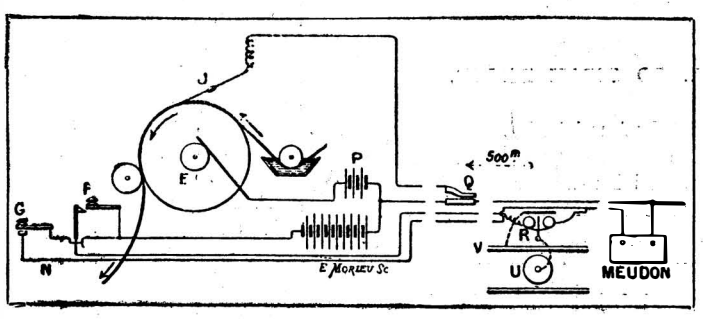


Fig. 2.—DIAGRAM OF THE APPARATUS.

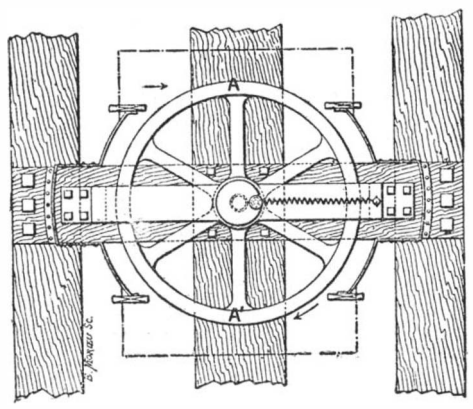


Fig. 3.—DRUM FOR PUTTING LOCOMOTIVE IN COMMUNICATION WITH WATCH TOWER.

APPARATUS FOR PREVENTING COLLISIONS OF TRAINS.

Railway accidents have been numerous in recent years, and the public concludes from this, not without some reason, that the systems now in use present defects, either theoretical or practical. It is therefore not without interest to make known a system of which the principle is very different from that which serves as a basis for the block system now employed.

It is Mr. Pellat, professor of physics at the Sorbonne, who has devised the apparatus that we are going to describe. The track is divided into sections of from 50 to 100 kilometers, and in the center of each section there is a watch tower where is stationed a man who knows at every instant the position of all the trains that are running upon his section. This result is obtained as follows: In the watch tower a clockwork movement revolves a cylinder over which passes a band of paper impregnated with

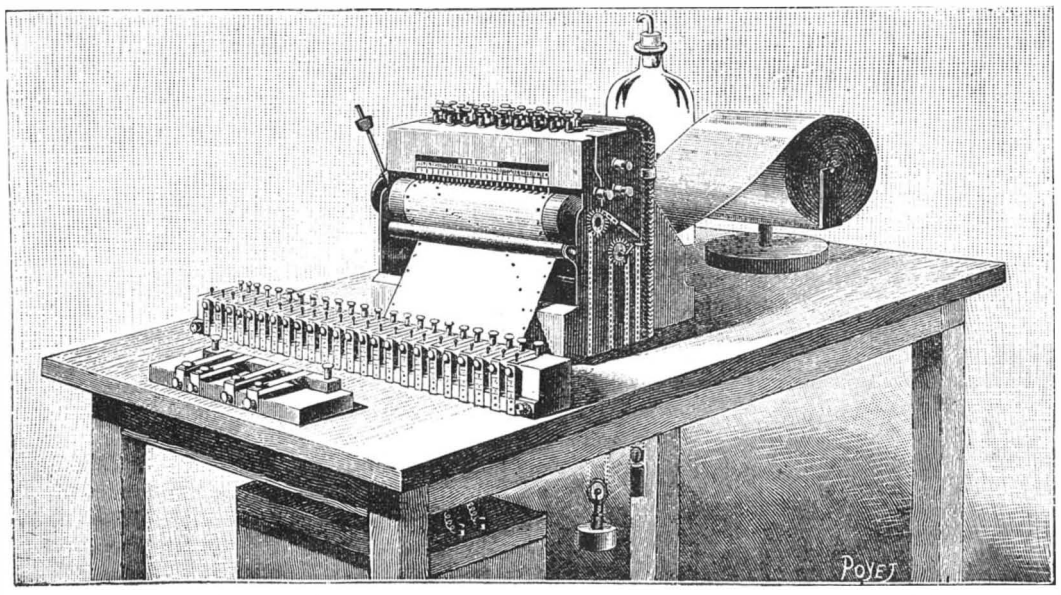


Fig. 1.—APPARATUS FOR REGISTERING THE RUNNING OF TRAINS.

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iodide of potassium. Upon the paper there bears a steel needle, R (Fig. 2) provided with a platinum point. This needle is connected by a wire with a pedal, P, situated upon the track. On another hand, the axis, E, of the cylinder is in communication with the negative pole of a battery, P, of which the positive pole is connected with the lower part of the pedal. When a train passes, its weight depresses the pedal, the circuit is closed, the iodide of potassium is decomposed at the point where the needle touches the paper, and the iodide set at liberty is shown by a black dot.

Upon the length of a section, a pedal may be arranged about every mile. Each is connected by a special wire with a needle of the watch tower, and all these needles are arranged along a generatrix of the registering cylinder. When a train passes over a pedal, the corresponding needle, which carries a number reproduced upon the pedal, marks a black dot upon the paper. At every instant the employe knows, then, over what pedal the train has just passed. He sees whether an express train is upon the point of telescoping an excursion one, whether two trains running in different directions upon the same track are about to meet, etc., and he prevents such catastrophes, since he can forewarn the engineers of the trains. In fact, in the center of the interval comprised between two pedals there is what is called a contact apparatus. This consists of a metallic drum about 80 centimeters in diameter and 20 in height. The locomotive carries a metallic brush, which, at the moment of the passage of a train, causes the drum to revolve. This drum is protected against rain, snow and frost by a galvanized iron box, but at the two extremities of the same diameter, AA′ (Fig. 3), it projects from the box. These are the parts that the brush touches. As this latter is very long (1·3 meters) it is capable of establishing a metallic communication with the drum, even if the unprotected parts of the latter are covered with frost, since it makes them revolve.

In the watch tower there are arranged in a row, like the keys of a piano, a series of commutators, each of which carries two numbers, those of the pedals between which is situated the drum with which the commutator enters into relation. When the employe puts his finger upon a commutator, a battery actuates a relay, which serves to put the rail in communication with the drum. The brush of the locomotive, electrically insulated from the general metallic mass of the engine, communicates with one of the extremities of the wire of a Hughes electro-magnet, the other extremity of which is connected, through the intermedium of a battery carried by the locomotive, with the latter and the rail. Consequently, there is a closed circuit when a drum is in contact with the brush. At this moment the electro-magnet is freed, and this sets in action a steam whistle, the sound of which warns the engineer.

It will be seen that the engineer does not have to observe at a distance optical signals which fog, for example, may render difficult to see. He is forewarned by a shrill sound that makes itself heard upon his engine, and he is so much the better warned in that the noise of the whistle continues so long as he has not himself closed the armature of the electro-magnet by hand. It will be seen that it is very difficult for him not to take notice of this signal.

Fig. 2 gives a diagram of the Pellat system. The needle, J, is put in communication with the pedal, Q, while the cylinder, E, is in relation with the negative pole of the battery, P, located in the watch tower. The commutator, F, is connected with the positive pole of the battery, *n*, which actuates the relay, R, and permits of making the drum, U, communicate with the rail, V. For all the pedals there is but a single return wire, which is utilized likewise for the circuit of the battery with which each commutator can communicate. All the wires that run from the registering apparatus to the various pedals are in a subterranean cable of about the diameter of the finger, and it is its lead covering that serves as a return wire. From a watch tower it is possible, also, to communicate with the stations situated in the same section. By means of other commutators, G, and of the wire, N (Fig. 2), it is possible to actuate at the stations any sort of optical signal, in order to give warning of the approach of a train.

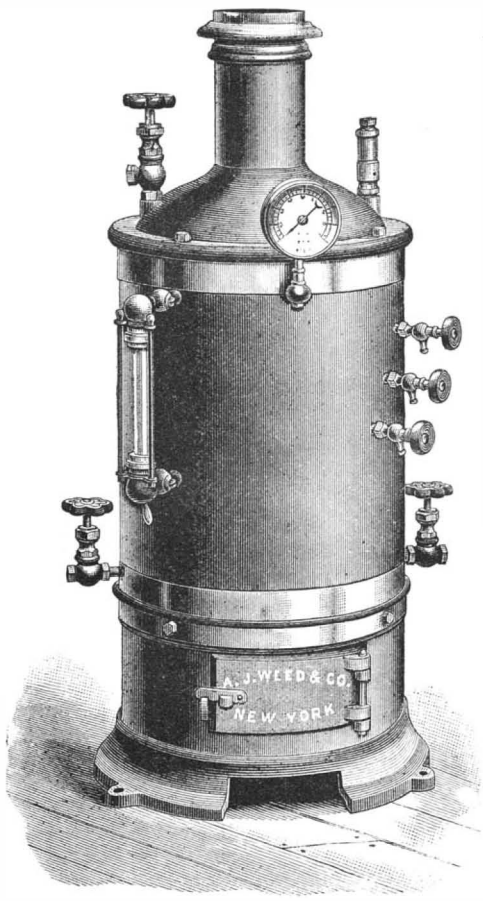
Fig. 1 represents a model that was sent to the Chicago Exposition. In the foreground are observed the commutators, by means of which the stations are put in communication, back of these the commutators, and, still further back, the needles and the registering apparatus. The track, which is not figured, has a length of seven meters. It has twenty-five pedals, and upon this track move two small locomotives, by means of which can be realized the different possible causes of collisions of two trains.

Upon the whole, Mr. Pellat's system presents several interesting peculiarities: At every instant one knows the precise situation of all the trains that are running along a section. It is possible to enter into immediate communication with one or more engineers and warn them, by a most striking signal, located upon their engine, that there is danger of a collision, and that they must, consequently, diminish their speed and take account of the situation.

No other system presents these various advantages. There is reason to hope that this system will be put upon trial. Practice will doubtless suggest modifications of detail, and we shall see by comparison whether the block system is to be retained or replaced by this new safety apparatus.—*La Nature.*

THE WEED STEAM BOILER.

This is a boiler in which the shells are made of solid steel tubes a quarter of an inch thick, with flat steel heads welded in, the first considerations in its construction being safety and durability. There are no screw or rivet joints, and no cast iron is used in the boiler proper. In the smallest size the tubes are made of seamless drawn brass, and in the larger sizes of steel, the tube holes being accurately drilled in perfect alignment, and the tubes fitted into the heads with patent expanders. The boilers are readily cleaned by removing a brass plug screwed into the bottom heads. The fire box is a solid casting into which the lower end of the boiler shell is set and to which it is firmly screwed. The inside of the fire box is lined with a non-conducting material to prevent waste of heat, and any description of fuel may be used—coal, wood, charcoal, crude oil, or gas, small pieces of fire brick being placed on the grate bars where an oil burner is employed, or a section of the grate bar being removed for the insertion of a gas burner when gas is burned.



THE WEED STEAM BOILER.

The boiler is completely furnished with all the necessary fittings, and the attachments used are the best made, including the well known Crosby steam gauges and safety valves. The boiler is made by A. J. Weed & Co., 106 and 108 Liberty Street, New York City.

A Cemented Irrigation Canal.

The Gage irrigation canal at Riverside, in Southern California, is 22 miles long. This canal has been in use for twelve years. It was found several years ago, says the *Pacific Lumberman*, that a great deal of water escaped by reason of gophers burrowing in under the canal, thereby injuring the canal to such an extent that it was found absolutely necessary to devise some means of preventing the enormous waste of water. It was finally decided to regrade and cement the whole canal, and the contract for doing this work was awarded to the Gray Bros., of San Francisco and Los Angeles, for about $120,000.

The cement was spread 1½ inches thick on the banks, and mixed one part cement to four parts fine sharp sand. At times more than 300 men were employed on this work, as it only could be done during the rainy season, when the water was not wanted for irrigation purposes. The first section of this work has been done now for about two years, and the cement holds perfectly good. Where heavy fills of earth were made, about 8 inches of masonry were used. It has been found that since this work has been finished the water company has received more than twice the amount of water obtained from the uncemented canal, thus showing that friction, evaporation, and loss of water by leakage were more than 50 per cent. This is supposed to be the longest irrigating canal known that is cemented throughout.

Big Trees in a Mining County.

Mariposa is a California county that has contributed immensely to the mineral wealth of the State. The county is seamed with quartz veins and is penetrated by the mother lode. The run of ores yields from $10 to $15 per ton, though numerous pockets are struck here and there running up into the hundreds per ton. There are several fine veins of good marble in the county. Silver and copper are also found. In topography, the county resembles Amador, Calaveras and El Dorado, and shares with Calaveras, Tuolumne, Fresno and others the possession of the marvelous sequoia forests which have made that region famous. Besides, the world-famed Yosemite Valley is in the northern part of the county, so that it has altogether better known scenic attractions than any other part of the State.

The sequoias are mammoths among trees, the Methusalehs of the forest. The sequoia timber belt along the Sierras extends from Calaveras on the north to near the head of Deer Creek on the south, about 200 miles. The sequoias are of California and are never seen outside this belt. They seem almost imperishable. No known trees in the world compare with them and their kin, the redwoods, for gigantic size. A tree from 300 to 400 feet high, 30 feet thick in the trunk, is a great curiosity, and yet there are a number of such. In the Calaveras Big Tree grove there are 150 trees more than 15 feet in diameter and 10 about 30 feet. One of the fallen monarchs must have been 450 feet high and 40 feet in diameter. The "horseback ride" as it is called, one of the wonders of the grove, is a hollow trunk through which a man can ride upright on horseback 75 feet, and theatrical performances have been given in it.

The State grove, in Mariposa County, is 15 miles south of Yosemite, and has 427 trees, including 134 over 15 feet in diameter, 18 over 25 feet, and 3 over 33 feet. A daily stage coach has been driven through one, 120 children and a piano crowded into another. A single tree would furnish two rail fencings 20 to 30 miles.—*Min. and Sci. Press.*

Remedy for Snake Bite.

BY C. D. R. KIRK, M.D., OHUQUALAK, MISS.

A few weeks ago a negro and his wife brought their eight-year-old boy to my office for treatment for snake bite, which had occurred only thirty minutes before their arrival. There were two wounds about an inch and a half apart, from which the blood was flowing rapidly. The snake was a long, blunt-tailed moccasin—a "copper belly"—and known to be almost, if not quite, as poisonous as the "cotton mouth" moccasin. The boy had stepped on the snake, and as his pants were short, the snake had a fair strike at his leg about five inches below the knee.

After some explanation and much persuasion, I induced the man to apply his mouth to the wound and suck the poison out. Immediately after each draw, I gave the man some strong alcohol to rinse his mouth, which I assured him would destroy the poison and prevent it from being absorbed. After thoroughly emptying the fang wounds in this way, and the blood had ceased to flow, I injected a half drachm of saturated solution of permanganate of potash in each wound; the boy also drank a small drink of diluted alcohol. A string which the man had tied around the leg remained until morning, when the boy, after a full night's sleep, awoke well, without pain or swelling; no further trouble.

A strong solution of the permanganate of potash gives almost immediate relief from pain, and from repeated trials I believe it destroys the poison or makes a chemical change which renders the poison harmless.

I was called some five or six miles to see a negro man who had been bitten about two hours before my arrival by a "rattlesnake's pilot," which is known to be equally as fatal as the rattlesnake. The patient was suffering most excruciating pain, which extended to his leg, having been bitten on the top of his foot, which was very much swollen. I immediately injected a strong solution of permanganate of potash, which gave immediate relief, and he was soon well.—*Ecl. Med. Jour.*

The Excellent Dock Facilities of Southampton.

The American liner Paris, on her arrival at the port, went alongside the quay on Wednesday at 7:20 P. M. The first bag of mails was landed within five minutes and the whole 465 bags which she brought were landed and checked in 13½ minutes, and the mail train was at once dispatched to London. The passengers commenced to land at 7:40, and a special train left with them at 8:15 P. M. The discharging of cargo commenced at 10 P. M., and although the vessel brought a large cargo she was cleared out in the course of Thursday. She took on board 2,400 tons of coal, and were it not for an extraordinarily large amount of cargo which she had to take, she would have been ready for sea on Friday evening. She left at midday on Saturday, with 250 saloon passengers. The second saloon berths were all taken, and she had a fair complement of third.

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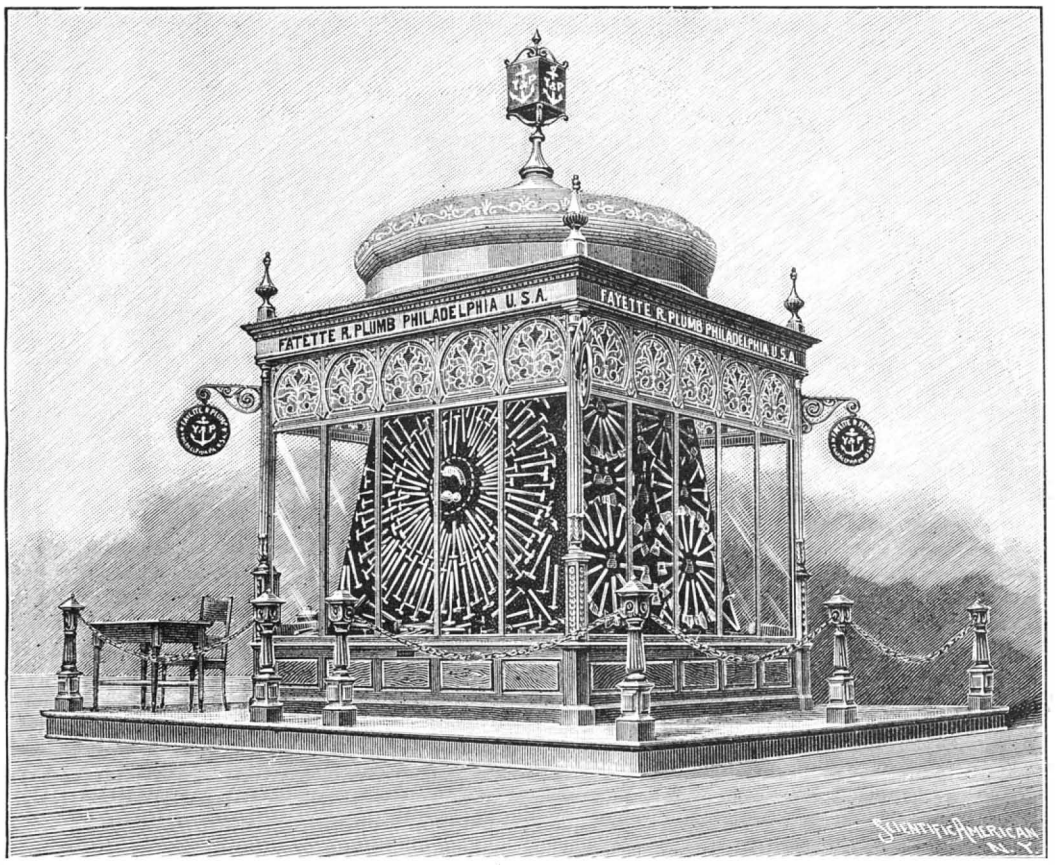
Decision Relating to Cary's Patent.

Letters patent No. 116,266 were granted June 27, 1871, to Alanson Cary for an improvement in furniture springs. The improvement related to spiral springs usually made in a conical form of steel wire, and used in upholstering sofas, chairs, etc. Such springs were made of hard-drawn wire, coiled, and forced to a proper shape; but in coiling the metal was unavoidably weakened, the outer portion being stretched, and the inner portion crushed. The invention consisted in subjecting the spring to "spring temper heat," which is about 600° F., by means of which a complete homogeneity in the metal was produced, thereby increasing its durability and power of resistance. The same process, however, had been long before used in the manufacture of "wire bells" for clocks, and in the manufacture of hair balance springs for marine clocks; the object being in the one case to give tone to the bell and in the other to increase the elasticity and durability of the spring. The Supreme Court rules that this use constituted an anticipation, notwithstanding that the purpose of the process was different from the purposes of the prior use, and that experts in the tempering of steel were surprised by the results produced by the patented process.

A WORLD'S FAIR EXHIBIT OF HAMMERS, EDGE TOOLS, ETC.

The great variety of tools shown in the very tastefully arranged exhibit of Fayette R. Plumb, of Frankford, Philadelphia, is indicated by the accompanying illustration. The business was established in a small way nearly forty years ago, but it has ever since shown a large and steady growth, owing to the high standard maintained for the goods manufactured, and the plant at present comprises several large buildings, fitted up with all the latest improved machinery and appliances. It is said that the establishment is now the largest and most complete in every department of any of the kind in the world. The manufacture comprises nearly everything in the line of edge tools, hammers and sledges, and railroad, miners' and blacksmiths' tools. All these goods are constantly carried in stock, and special tools are also made to order after any model furnished. A large and handsome illustrated catalogue describing these goods is sent on application.



THE WORLD'S COLUMBIAN EXPOSITION—FAYETTE R. PLUMB'S EXHIBIT OF HAMMERS, SLEDGES, EDGE TOOLS, ETC.

Progress of the Sugar Industry.

The New Orleans *Times-Democrat* says: The United States paid bounty on 358,000,000 pounds of sugar in 1891–92, and on 429,243.170 pounds last year, while the calculations of the collector of the internal revenue estimate the crop this year at 691,449,000 pounds. If it is anywhere near these figures, it will exceed the largest crop ever known in ante-bellum or slavery days. This increase shows what Louisiana is capable of in the matter of sugar production, and leaves no doubt whatever that the State can fill the sugar demand of the whole country if the bounty law is allowed to run for the original time provided for it by Congress—fifteen years.

This improvement has been brought about largely by the use of new and improved—and very expensive—machinery, which has called for the expenditure of millions of dollars.

The truth of this is shown by the figures of the old and new process sugar turned out. It was but a few years ago that our planters manufactured the bulk of their sugar in open kettles. The bounty law has driven them from it, and to-day only 19 per cent is made by that process. When it is noticed that the plantations using improved machinery secured 2,718 pounds of sugar per acre, and the old mills only 1,111 pounds, we can readily realize that every planter in the State would make the change if his finances allowed it.

Dr. Robert A. Lamberton.

Dr. Robert A. Lamberton, president of Lehigh University, died at his home in Bethlehem, Pa., September 1, of apoplexy. Mr. Lamberton was born in Carlisle, Pa., December 6, 1824. After the resignation of Dr. Henry Coppe in 1880. Dr. Lamberton was elected to fill the vacancy. Dr. Lamberton was a born educator, for in 1880 the number of students in Lehigh University was 200. To-day 600 are on its roster.

Castor Oil.

The castor oil bean—seeds of *Racinus communis*, *Palma christi*, *Racinus sanguineus*, of the East Indies and Italy, also of the Southwestern States and California, and identical with the "Hiquerillo" of the South American states, where it grows in abundance without cultivation.

The beans contain from 50 to 60 per cent of oil; 100 pounds of clean seeds yielding about 30 pounds of fine oil at first pressing, 15 pounds of a second quality by additional heat in pressing, and an additional 5 to 10 pounds by heating the mass with steam or in an oven and a final pressing; the last being only suitable for burning in lamps.

In Italy, Calcutta, and Madras, for the best oil the pods are dried in the sun or by artificial heat, and the beans that do not discharge themselves from the pod are thrashed out with flails or by treading. The beans are then pounded with wooden mallets or rams to crush the shells. A better plan, as practiced in the United States, is to pass the beans through a pair of rollers made of very hard wood or iron, set about three-sixteenths inch apart, so as to just crush the bean without making a pulp, the beans being thrown into a hopper above the rolls. Then for cold-pressed oil, which is the best, the crushed beans are placed in flat canvas bags, holding about one gallon each, and piled on flat iron plates, alternating plate and bag, in a screw press, or, if on a large scale, a hydraulic press, where by slow compression the oil runs to a receiving tub. This process renders nearly one-half the contained oil. For the balance, the cakes should be removed, crushed and heated to about the boiling point of water, rebagged, and again subjected to the press, or, what is preferable, to keep the two qualities of oil separate, use a separate press and greater pressure.

There are two methods of clarifying the crude oil as it comes from the press. The first, by sun exposure in shallow tanks made of tin and covered with glass to prevent dust or leaves from falling into the oil. One day's exposure to a clear sun will separate the milk and glutinous matter, which settles, when the clear oil can be decanted from the top. The other plan is to heat the oil in the tanks partly filled with water, by means of a jacketed kettle or steam coils, if convenient, so as to boil the water slowly. This coagulates and absorbs the glutinous matter and dirt that may accidentally get into the oil by handling. On cooling in the tanks, by shutting off the heat, the impurities settle in the water, and the oil can be drawn off from the top. If then found to have any foreign matter, it should be filtered through cotton cloth. With the strong solar heat of tropical countries, the solar process is preferred.

A small pressing plant of ten gallons of oil per day, as suggested by our Honda correspondent, will need a pair of hard wood rolls 8 inches long, 6 inches diameter, fitted in a wooden frame, a scraper on each roll at the lower side, a crank at opposite sides, or geared much after the style of sugar cane rolls; an oil press, which can also be made of hard wood and laid horizontally, which will allow the oil to drop directly into the pan. The plates may be three-sixteenths inch thick and about one foot square. The bags may be only squares of light canvas, folded cornerwise over a half gallon of the crushed beans and laid between the plates. The solar process of clarifying requires a tin vat or pan, three feet diameter by one foot in depth. The clarified oil may be dipped from the top.

Rice and Wheat Harvesting.

The rice harvest is now on in Louisiana and the low prices for rice now prevailing, the *Louisiana Planter* says, are forcing a cheaper harvest than ever before, but even with this economy a profit on rice culture seems out of the question.

Wheat culture in California has been so perfected that it seems possible for California wheat growers to meet any possible competition. In a recent issue of the *Hollister Advance*, of San Benito County, Cal., the editor predicts that the day of the steam thrasher is about done, and that the experience of this season shows that the new *wheat harvester* will cut, thrash and sack the grain at less cost than the mere thrashing by the old method. It says that an owner of the harvester will cut and thrash wheat at the rate of $2 per acre, the farmer boarding the men and feeding the horses. Five men are required to run the harvester, whose combined wages are $12 per day. Twenty-four horses are required, with an extra pair in case of an accident. A fair day's work is thirty acres, as work cannot be started very early in the morning and not until the grain is thoroughly dry. The *Hollister Advance* reports six harvesters at work in San Benito County, and expects triple that number working next season.

It has long seemed imperative that there should be some reform in the Louisiana rice harvest, and that the Mosaic if not the Adamic sickle should be abandoned and the McCormick, Osborne, or other harvester adopted. There are advantages pertaining to California that make possible machine harvesting there when it might be impracticable elsewhere. They have a rainless harvest, no ditches and immense fields. Our disadvantages in machine harvesting rice are our frequent rains during the harvest season and our numerous ditches and small fields.

In the western part of the State, in the prairie section, machine harvesting has become the rule, *i. e.*, rice is there cut and bundled by machine. Hence it has become possible to exist in rice culture there when impossible in the river parishes and along Bayou Lafourche.

Our contemporary says: Rough rice now is worth no more in Louisiana than oats are in Ohio and Indiana, pound for pound, and yet we learn of no economic move along the river in the matter of the cost of the harvest other than the cutting down of the laborers' wages. This is always an unpleasant remedy, but, of course, now unavoidable. If the rice industry is to continue in the river parishes there must be some radical change in the cost of its harvest, and the efforts and experiences of the farmers of California suggest the direction in which to look for relief.

The Parsee "Towers of Silence," India.

A Parsee correspondent from Central India, Maneck K. Thanewala, mechanical engineer and textile manufacturer, writes us relative to the Parsee funeral obsequies, as described in the SCIENTIFIC AMERICAN in 1886, and gives more exact particulars. When life is extinct the body is wrapped in clean clothes and placed on polished stones on the floor, the face of the deceased being exposed to the gaze of a dog three or four times during the recitation of the funeral sermon, the glance of the dog being supposed to have power to scare away the Evil One. With the same idea a dog is conducted over the way by which a dead person has been carried, to make it again suited for use by man and beast. The dog must also have certain special marks, be of yellow color, or white with yellow ears, and have two black spots over his eyes. The body is carried on an iron bier, accompanied by male relatives and friends, to one of the so-called "Towers of Silence," a number of which are to be seen near Bombay and in many other places in India. They are circular, unroofed, stone structures, in solitary places, where the bodies are left uncovered and exposed to the sun and rain, to be devoured by vultures, numbers of which are always to be seen in the neighborhood. The bones are afterward thrown indiscriminately into a central pit of the structure. Illustrations and more extended description of the burial ceremonies will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 925.

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Our New War Ship Minneapolis.

The Minneapolis, a sister ship of the commerce destroyer Columbia, was launched August 12, at Philadelphia, in the yard of Wm. Cramp & Son's Ship and Engine Building Company. The Minneapolis was christened by Miss Washburn, in the presence of Mayor Eustis, of Minneapolis, Vice-President Stevenson, Secretary Herbert, etc. The new vessel is 412 feet long, beam 58 feet, mean draught 22 feet 6·5 inches, displacement 7,350 tons, indicated horse power 21,000. The hull is steel and has a double bottom, with considerable space between the two skins, this space being divided by numerous bulkheads into watertight compartments. The Minneapolis is, before all, a commerce destroyer, and is not intended to fight, so she is not armored. Her conning tower is of mild steel and her protective deck is a variety of turtleback, and is 4 inches thick on the sloping portion. The gun shields are 2 inches thick, or only sufficient to protect the gun crews from the fire of machine guns. Patent fuel will be stowed to a thickness of 5 feet around the machinery. The armament consists of one 8 inch standard breech-loading rifle, two 6 inch rapid-fire rifles, and eight 4 inch rapid-fire rifles. The secondary battery is composed of twelve 6 pounders, four 1 pounders, and four Gatling guns. The vessel is provided with five torpedo launching tubes. The 6 inch guns are loaded at one operation, as fixed ammunition is used, the powder and shot being combined in an immense cartridge, standing nearly 6 feet high.

The Minneapolis will be driven by triple screws. Two of the screws are located as usual, one under each counter, a considerable distance above and away from the line of the keel and forward of the stern post. The third screw is placed in the midship line, close down to the keel and just forward of the rudder. Each of the three engines is independent of the others, and is contained in a watertight compartment. The midship screw will be used under ordinary circumstances, as this screw will drive the vessel at a speed of ten knots an hour with great economy of fuel. The use of all three engines will send the speed up to twenty-one knots an hour or even more. The Cramps expect the Minneapolis to make twenty-three knots on her trial trip, which would insure her builders $400,000 as prize money in addition to the contract price of $2,690,000.

There is probably only one vessel afloat which could lead the Minneapolis an unfruitful chase—the Campania; but owing to the unwarlike appearance of the Minneapolis, it would, doubtless, be possible to creep within range of the "ocean greyhound," and once in range, any superiority of speed would be of little avail. The Minneapolis can not only run away from a line-of-battle ship, but can lead such a vessel a chase that would soon consume all the available fuel. The nominal radius of action of the Minneapolis—that is, the distance that she can steam without recoaling—will be 26,240 miles. This is the theoretical radius; but without doubt the Minneapolis will have a practical cruising radius of 15,000 miles. It is upon this wonderful power of making long runs, half way round the world if necessary, that the Minneapolis will deserve the name which she bears equally with the Columbia, of the "Pirate." This name is, of course, not officially recognized by the Department of the Navy, but was given by the shipbuilders when the vessels were only known as cruisers Nos. 12 and 13. The inhabitants of the city of Minneapolis should begin at once, if they have not already done so, to raise a subscription for the silver service, and it may be safely said that as our Western friends do not do things by halves, the new cruiser will have a silver service second to none.

A Remarkable Arizona Ruin.

Near Flagstaff, Ariz., and on the Upper Verde, there are the ruins of castles still in as good a state of preservation and much resembling many of those in the north of England and Scotland, the ages of which we may approximate with a considerable degree of certainty. One in particular that is very interesting stands near the head of the Verde River on a peak that constitutes the extremity of a spur of the Bradshaws. The peak is granite, and rises abruptly out of the valley on three sides, while the fourth is protected by the mountain spur, which is about 100 feet higher and hangs an impassable precipice above the smaller. On this shelf or bench the building was constructed of stone and cement in such a position that one on the ruins can get a good view of the entire width of the valley and fully five miles either up or down it. Through the taller mountain a volcanic rift has allowed a perpetual stream of water to flow, though it was fully 60 feet beneath the base of the castle and back of it, so that the water came out underneath the cliff and flowed across the mesa into the river. In order to protect themselves against a water famine in a time of siege the inhabitants cut a fissure through the solid rock fully 60 feet, and changed the course of the stream so that it flowed out on the opposite side of the rock and directly through the fortification, making it impossible to cut off the supply. This building was over 400 feet in length by 250 in width. One of the walls yet stands, four stories in height, though some earthquake has changed the surface of the mountain until the outer one has fallen and the one now standing leans considerably toward the north. This structure alone contained over 200 rooms, and could have easily accommodated a thousand people. Back of this is a cave, partly natural and partly artificial, that extends more than 100 feet, and through which they descended to the water. This was also cut up into rooms, each one of which was nicely plastered with some kind of cement that is now in a good state of preservation. There are niches in the walls, where they evidently kept their jewels and valuables, and I am informed that two small rush bags were found in one of them, though I did not visit it first and did not see them. A number of jars filled with parched beans were taken out, and one of these jars, or ollas, holding about a bushel, is in the possession of Mr. Drew, who has a ranch near by, and is used all the time for holding drinking water. It is of a very dark-colored material, thoroughly glazed, but, outside of the heat necessary to do the glazing, it has not been affected by fire. It has been cracked almost entirely around, but has been mended with some kind of gum so deftly that, though it had been in his possession for years, Mr. Drew had not discovered it until one day recently when we were examining it together.

In this cave about twenty skeletons were found. The skulls of some of them had been crushed, while others appeared to have died natural deaths, though the bones were so badly decayed that had fatal wounds been inflicted on any other part of the body than the head it could not have been discovered when we made our examination. These remains were scattered about the inner rooms in evidently the same position in which they had fallen from starvation or had been laid by the hands of their comrades after being stricken down by their foes. Around the bony necks were found the amulets and on the wrists the shell bracelets that protected them from evil or served them as ornaments during life.

This structure was built altogether different from the fortresses of Zuni and Acoma, neither does it resemble any of the pueblo buildings in New Mexico. Judging from the mass of cement scattered about on the cliff, these walls must once have been fully six stories in height and the buildings almost as large as the Casa Grande in the Gila River Valley.—*San Francisco Chronicle.*

The Need of Improved Waterways.

Among the most interesting papers as yet written on the subject of a waterway from the lakes to tidewater and its effect upon transportation rates is that recently presented to the Water Commerce Congress in Chicago, by George Y. Wisner, of Detroit. He favors a radical enlargement of the Erie canal, or the construction of a new canal along practically the same route. "Canada has expended $52,000,000," he says, "in constructing canals and $215,000,000 in cash and guarantees for railroads for the purpose of diverting American trade through Canadian ports, yet of the 390,000,000 bushels of grain received at the Atlantic ports of the United States and Canada in 1892, only 27,400,000 bushels, including Canadian grain, was received at Montreal. The investigation made by the Senate committee of interstate commerce in 1889 shows that Canadian canals, with rebates making them practically free for St. Lawrence River freights, have had but little effect in diverting traffic from American ports. . . . It will not do to assume that Canada will soon become an integral part of the United States, for such an event is so improbable that to delay the improvement of transportation routes, with the hope of thus being able to accomplish the purpose for less money, will cripple the commercial growth of the country far in excess of anything that can be saved; besides, the surest means of inducing Canada to come into the fold is to place our commerce in such an independent condition as to have no need of the natural advantages she has to offer. . . .

"At the present rate of increase the receipts of grain at Atlantic ports would probably exceed 600,000,000 bushels annually before the canal could be completed. At least one-half of this amount would go direct by lake and canal, and the rate on the whole would be governed by that on the waterway. The average rate by lake and railroad for the past four years has been 8·5 cents per bushel, and allowing 1·5 cents for higher rate of winter traffic, the net decrease would be at least four cents per bushel, or $24,000,000 for yearly shipments of grain, while that on merchandise and other freight would be fully as much more, making a total of $48,000,000. If the work should be undertaken by the government, money could be obtained for the project at 3 per cent, at which rate the above annual decrease in cost of transportation would be the interest on $1,600,000,000. The canal can undoubtedly be constructed for less than $200,000,000, which at 4 per cent for interest and maintenance would leave a net balance of $40,000,000 annually in favor of the project. The benefits to be derived should not, however, be measured by this amount, for the home prices of manufactures and agricultural products are those which they bring in foreign markets less the cost of transportation, and consequently any decrease in the cost of the transportation adds a like amount to the value of all productions used for domestic consumption."

Shorthand.

The Bureau of Education at Washington has issued a monograph on "Shorthand Instruction and Practice," by Mr. Julius Ensign Rockwell. Mr. Isaac Pitman is mainly the author of the system that is followed in the United States, and although the art of stenography is very old, dating from the first epoch of legal advocates, he was the first to make a scientific study of phonology and base his alphabet on its principles. Those who have followed his system of reporting have been able to write as many as two hundred words a minute and read their notes with facility, and the venerable author of this system is still living and active in his old age, and has had the satisfaction of watching all the stages of the revolution in the art of transferring thoughts to paper which he has been chiefly instrumental in promoting. In this country the number of persons receiving instruction in shorthand from July 1, 1889, to June 30, 1890, was 57,375, and of this number 23,325 were males and 26,005 females. All these were taught in schools and classes, and out of this whole number 7,228 were instructed by mail. In 229 schools and classes in which shorthand was introduced during the scholastic year ending June 30, 1891, the number of persons taught orally was 4,150, which, with those instructed by mail, made a grand total of 4,738. Of those taught orally, 2,474 were males and 1,658 were females. This is as near a correct statement of statistics as Mr. Rockwell has been able to arrive at, and it shows the vast extent of the use of shorthand instruction in this country in all the departments of life.—*Boston Herald.*

Our Fundamental Units of Measure.

Among the interesting papers read before the Engineering Congress at Chicago, was one on the above subject by Dr. T. C. Mendenhall, Superintendent of Standard Weights and Measures, from which it appears that in many respects the most important legislation upon the subject was the act of July 28, 1866, making the use of the metric system lawful throughout the United States, and defining the weights and measures in common use in terms of the units of this system. This was the first general legislation upon the subject, and the metric system was thus the first and, thus far, the only system made generally legal throughout the country.

In 1875 an International Metric Convention was agreed upon by seventeen governments, including the United States, at which it was undertaken to establish and maintain at common expense a permanent International Bureau of Weights and Measures, the first object of which should be the preparation of a new international standard meter and a new international standard kilogramme, copies of which should be made for distribution among the contributing governments. Since the organization of the bureau, the United States has regularly contributed to its support, and in 1889 the copies of the new international prototypes were ready for distribution. This was effected by lot, and the United States received meters Nos. 21 and 27 and kilogrammes Nos. 4 and 20. The meters and kilogrammes are made from the same material, which is an alloy of platinum with 10 per cent of iridium.

On January 2, 1890, the seals which had been placed on meter No. 27 and kilogramme No. 20, at the International Bureau of Weights and Measures, near Paris, were broken in the cabinet room of the Executive Mansion by the President of the United States, in the presence of the Secretary of State and the Secretary of the Treasury, together with a number of invited guests. They were thus adopted as the national prototype meter and kilogramme.*

Preserving Bodies in their Natural Form and Color.

The following preservative fluid is employed by G. E. Wiese: 600 grammes of sodium hyposulphite dissolved in 5,000 grammes of water and 75 grammes of ammonium chloride dissolved in 250 grammes of water. The two solutions are mixed together and added to 4–6 liters of spirits of wine. The bodies of the animals to be preserved are simply immersed in the above preparation; and it is claimed that they will retain their original form and color for almost an unlimited period.

* Reference to the act of 1866 results in the establishment of the following equations:

$$1 \text{ yard} = \frac{3600}{3937} \text{ meter.}$$

$$1 \text{ pound avoirdupois} = \frac{1}{2{\cdot}2046} \text{ kilo.}$$

A more precise value of the English pound avoirdupois is $\frac{1}{2{\cdot}20462}$ kilo. differing from the above by about 1 part in 100,000, but the equation established by law is sufficiently accurate for all ordinary conversions.

As already stated, in work of high precision the kilogramme is now all but universally used and no conversion is required.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

TRACK LIFTER.—William L. Whitfield, Ocala, Fla. In this device the lifting mechanism is supported on a truck frame, a toothed wheel fixedly held on the axle being engaged by an operating lever, and there being connections between vertically arranged rack bars and the axle. One of the rack bars is termed a jack bar, and has a removable foot or rest member, supported on the ground, the opposite rack bar, termed the lifting bar, having at its lower end clamp hooks to engage the tie. By this arrangement, on the operation of the lever, the tie track and the truck are both raised simultaneously.

Mechanical Appliances.

WRENCH.—William C. Lawrence, Casselton, North Dakota. The body bar of this wrench has a jaw formed at one end, and upon the surface of the body is firmly secured a nut through which extends an adjusting screw with which is pivotally connected the shank of a hook-shaped jaw adapted to extend over the jaw on the body, whereby the hook-shaped jaw may be dropped to stand at a right angle to the body bar. The device is more especially designed as a pipe wrench, affording a firm grip which is released by a single movement of the hand, without the aid of ordinary thumb or adjusting nuts.

SAW SWAGE.—Richard E. Dimick, Rhinelander, Wis. In a slotted swage block turns a swage die having a flattened portion within the slot, near which is a stationary anvil carried by a shaft turning in the block for effecting the angular adjustment of the anvil, which may protrude more or less from the shaft. Oppositely arranged dressing dies are also actuated simultaneously with the swage die to dress one tooth while another tooth is swaged, intermediate mechanism connecting the swage die with the dressing dies. The arrangement also admits of regulating the width to which the tooth is dressed by the dies.

DIE STOCK.—Joel G. Jackson, Minneapolis, Minn. Lugs on the upper face of this stock hold the dies, one lug being straight and having on its inner edge an overhanging flange and the other lug being inclined. A wedge has lateral and longitudinal movement between the inclined lug and the dies, a face plate overlapping the wedge, while limiting screws extend through the face plate, through slots in the wedge, and into the stock body, there being a lever for moving the wedge. The dies are firmly held and may be readily inserted or removed, and by the accurate adjusting mechanism the dies may be set to cut any desired size of thread within reasonable limits.

Agricultural.

CORN HARVESTER.—Warren E. Abbott, East Monroe, Ohio. This machine has side tables which may be raised or lowered, and the tables have guide fingers with rotary cutters to cut the corn quickly and perfectly, whether it is presented to the cutter in an upright or an inclined position, or whether the roots have been destroyed by grub worms or the corn stalks are tough or withered. The rotary knives are driven from the supporting wheels, and may be conveniently thrown out of gear with the driving mechanism, or the cutters may be thrown out of the path of any of the stalks which it may be desired to leave standing as supports for the shocks.

GRAIN SCOURING MACHINE.—Peter Provost, Menominee, Mich. This invention provides an improvement upon machines which have been made the subject of several former patents by the same inventor, the construction being simple and durable and the machine being designed to scour and polish the grain perfectly and remove all impurities. A revolving disk carrying a woven wire scouring disk discharges into a ring provided with annular interior flanges formed with slots and openings for the passage of the grain, a fixed wire disk being supported on top of the ring, to which is bolted a second ring carried by the second wire disk, while downwardly extending projections are arranged on the second ring to engage the first ring.

STRAW CARRIER.—Howard and George Ghere, Frankfort, Ind. This improvement may be attached to any form of thrashing machine, and has a level table receiving the straw from the thrasher and delivering it to the elevators. The wind is prevented from interfering with the transfer, and the body of the carrier may be made in two sections, one to be placed beneath the other or to extend a certain distance beyond its outer end. Simple means are also provided to give any desired inclination and elevation to the elevator sections of the carrier, the movable elevator sections being readily manipulated.

BAND CUTTER AND FEEDER FOR THRASHING MACHINES.—George N. Kern and James W. Fielder, Mason City, Ill. The feed boards or pans, according to this improvement, move in horizontal planes, and are alternately reciprocated, each feed board being provided with a series of adjustable fingers whereby the grain is presented to the cylinder of the thrasher in the best shape and with a movement as nearly as possible to that of hand feeding. Over the feed device and in front of the delivery end of the carrier are located knives to cut the ties of the bundles. The attachment may remain permanently attached to the thrasher and be disposed of in such manner as not to be in the way.

CHURN.—Hiram F. Quigley, Atoka, Indian Ter. This is a dasher churn, having a perforated inner cylinder for the dasher to work in, this cylinder being open at its bottom. where it has an outside encircling flange resting upon the bottom of an outer close cylinder. When the perforated cylinder is lifted out after churning it brings out the butter, which forms upon the top of the buttermilk and upon the sides of the cylinder.

SHEPHERD'S CROOK.—Robert L. Renz and Henry Weidman, Poplar, Montana. This crook has a smooth inner surface at its crook portion, and a curved spring secured to the shank and extending forward to normally press the inner surface of the crook portion, the free end of the spring extending within an orifice of the shank, thus affording a spring latch by means of which the leg of an animal may be caught and held.

Miscellaneous.

HARNESS SUSPENDING DEVICE.—Louis Townsend, Evansville, Ind. That fire engines may more quickly respond to alarm signals it is usual, in city fire departments, to employ suspending devices by which the harness is held in such position that it may be quickly dropped upon the horses, thus effecting a great saving in the time of harnessing. This invention provides an improvement in such devices, comprising a counterbalance, a harness bar with spring-actuated bolts at its ends and intermediate trigger connections, with an operating cord, and various other novel features.

DETACHABLE TIRE.—Arthur C. Gillette, Jersey City, N. J. This is a flexible tire and guard formed from a single piece of sheet metal, with spurs on its face and fastening lacings for securing it to the felly of the wheel. It is especially adapted for use upon bicycles with pneumatic tires, to which it may be quickly strapped to enable the wheels to be ridden safely over rough ground or ice, and being readily removable. It is also a practical ice creeper for the wheel, facilitating all riding over ice and snow.

ELASTIC HORSESHOE.—Michael Hallanan, New York City. A rubber shoe which has an integral rubber pad and frog is provided by this invention, the shoe being continuous to form a complete closure of the hoof, and having a backing of leather with an interposed layer of canvas, the whole being united together and affording a firm bearing for the horse, while being sufficiently yielding to prevent jar.

HORSESHOE AND PAD.—The same inventor has patented a further improvement by which the shoe and pad are so made as to give the horse a firm bearing and relieve the foot of strain at the inside quarter, by causing the weight to come on the pad and on the shoe at the outside quarter. The pad has a yielding frog and a raised bead, outside of which is a flange on which the shoe is seated, having a reduced thickness at the inside quarter, where the surface of the pad projects beyond the shoe. The facing of the pad is of rubber secured to a layer of canvas, and this is backed by leather; but, to absolutely prevent the picking up of nails, a thin steel plate is interposed between the leather and the canvas.

FLOATING SIGNAL FOR SUNKEN VESSELS.—Johan Larsson, Ludington, Mich. This is a buoy to show the location of a sunken craft, whose name will be indicated on a flag carried by the buoy, while room is provided for a hermetically sealed case with memoranda. The buoy is supported on the vessel, in connection with a line attached thereto, arranged in such a way that should the vessel sink the line will be paid out, and the buoy will float over the sunken vessel to which its line is attached.

WINDMILL.—Edwin L. Davies and John N. White, Salt Lake City, Utah. Tubular arms connected with the wind wheel shaft carry reversely located vanes extending farther below than above the arms, the arrangement being such that on one side of the hub the vanes will be perpendicular and on the other side horizontal. A shaft connects the vanes of each arm, and a centrifugally operated governor slides on the vane shafts, whereby the vanes will be carried with their edges to the wind when it blows too hard, or the speed may be automatically limited to a certain rate.

SULKY.—Moses McCormick, Baltimore, Md. This is a trotting sulky with pneumatic tires, and with an arched axle extending centrally well above the tops of the wheels, while to each downwardly bent end of the axle are bolted two metal bars, whose lower ends form an outer and inner bearing for an individual axle for each wheel, one of the bars descending upon the outside and the other upon the inside of the wheel.

BOOKCASE.—James Stimson, Watsonville, Cal. This is a case or stand suitable to rest upon any flat surface, as a bureau, mantel, desk or table, or to stand upon brackets, and hold books of reference or volumes in frequent use. It comprises but three pieces, a base and two L-shaped clamping arms, and the number of volumes accommodated is regulated by the length of the stand. When not employed it may be compactly folded and stored away.

PIANO HAMMER.—John Ammon, New York City. The hammer head, according to this invention, is forked, and a felt made from a V-shaped blank, and doubled up at its sides, the contacting faces being fastened together, is inserted in the fork. A simple and durable hammer is thus made, not liable to get out of order, and one which will sound the string to avoid hardness and produce a very clear tone.

ROLLER SKATE.—Russell C. Leedham, Salt Lake City, Utah. The wheel of this skate is supported in a frame that is spring-cushioned on guides to be attached to the wearer's feet and legs, provision being made to prevent any backward movement of the wheels. The tire or periphery of the wheel is rubber covered, and the cushion springs absorb the shocks of a rough road, enabling rapid progress in use, and the ready ascent of moderate grades, by simply stepping forward as in walking or running.

LIFTER OR DRAINER.—William W. Olcott, Fremont, Neb. This is a simple device, consisting of two oppositely arranged wire members crossed and pivoted on a common fulcrum, so that their upper portions serve as handles and their lower portions as a clamp to hold the body portions of kettles, pots, pans, and similar articles, so that when they and their contents are hot they may be easily and safely handled and drained. The device holds the cover in place, and holds the body of the kettle, etc., in a rigid manner, so that it may be tipped as desired.

DESIGN FOR A TEA OR COFFEE POT.—Austin F. Jackson, Taunton, Mass. This design presents an original shape and rich and novel ornamentation of the bowl, as also of the mount and top, the spout and handle also showing most artistic and elaborate decoration.

SUSPENDER ATTACHMENT.—Georg L. Heuler, St. Louis, Mo. Clips, with perforated lugs in which are rings engaging a middle bar having a central opening, are secured to the trousers at the front and rear by means of eyes or spurs, the central opening of the middle bar being engaged by a hook plate attached to or connected with the suspenders. The device is designed to afford great flexibility, be readily adjustable or removable, and the parts are not liable to become accidentally detached.

CATHETER HOLDER.—William W. Lovejoy, Cochituate, Mass. This is a simple and light device adapted to hold a catheter of any kind in proper position, so that it may be worn with comfort. It comprises a collar with which a clamping arm is movably connected, while a locking device is adapted to hold the arm stationary upon the collar.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

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THE PRINCIPLES OF FITTING FOR APPRENTICES AND STUDENTS IN TECHNICAL SCHOOLS. By A Foreman Pattern Maker. London: Whittaker & Co. New York: Macmillan & Co. Not dated. 16mo. Pp. 313, 250 illustrations. Price $1.50.

The book describes the method of lining out work, the use of templets, chipping, filing, drifting, adjustments, repairs, joints, friction, lubricants, etc. The appendix contains a remarkable collection of useful notes, rules, and tables.

ELECTRIC LIGHTING AND POWER DISTRIBUTION. By W. Perren Maycock, M.I.E.E. London: Whittaker & Co. New York: Macmillan & Co. 1892–93. 16mo. Three parts. Pp. 452, 273 illustrations, folding plates. Price 75 cents each part.

This is an excellent work. The first chapter begins by defining fundamental units, then the general laws of electricity are given and illustrated by simple mathematics. Many of the illustrations are sketchy and show the point directly. The illustrations of voltmeters, ammeters, etc., are numerous and show the principal types. As the reader proceeds, dynamos, motors, and the various systems of distribution are described. A series of valuable rules are given in the last part. The work abounds with questions and has a good index. The series will prove a valuable addition to any electrical library.

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SEPTEMBER, 1893.—(No. 95.)

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2. Plate in colors showing the Queen Anne residence of W. H. McKnight, at Springfield, Mass., erected at a cost of $11,500 complete. Perspective views and floor plans. An attractive design.
3. A colonial dwelling erected at Rutherford, N. J. Perspective view and floor plans. A model design. Cost $3,476 complete. Mr. H. G. Ten Eyck, architect, Newark, N. J.
4. A cottage erected at Bridgeport, Conn., at a cost of $2,775 complete. Floor plans, perspective view, etc. Mr. A. M. Jenks, architect, Brooklyn, N. Y. An excellent design.
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Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(5366) A. Y. writes: A recent test for pressure of our village water works, a Shaffer-Budenberg gauge being used, indicated 180 pounds, for which I claim the head in feet should be not less than 425. A party employed as foreman in the construction of these works, and who thereby has acquired a quasi-reputation in our midst as an authority upon hydraulic matters, asserts that the head is only about 250 feet, that the high pressure is owing to the careful manner in which the pipes were laid, as avoiding angles or deflections. Will you kindly set at rest this country store controversy, and possibly educate this engineer? A. The hydrostatic head due to the gauge pressure is 414 pounds per square inch. If the gauge is located at some distance from the source, the friction head should also be added to the gauge pressure, which may carry the pressure up to your figure. The careful manner of avoiding curves would lessen the otherwise friction head, but could not make it less than the static head at the point of gauge connection.

(5367) A. L. asks: What kind of paste causes paper to adhere to an iron pulley? Also, if you please give answer to my last question of three or four weeks ago, viz., how many cubic feet of natural gas an hour it takes to run a five horse power engine? A. Use the best light glue that is tough in bending the pieces. When made up thick for use, add a half gill of clear extract of oak or hemlock bark or a solution of tannic acid. Mix and use at once. The pulley should be cleaned and scratched on the face with a file to make the glue take a stronger hold. Moisten the paper and put on a number of thicknesses, gluing each layer. It will require about 600 cubic feet of natural gas, according to its heating quality, per hour for five horse power.

(5368) A. C. asks some simple way to silver plate a spot on a cornet without the aid of electricity, and please state whether or not the same will put a coat on a surface covered with black lead. A. Silver plating that has been worn off by handling can only be renewed, other than by electro-plating, by rubbing the spots with moistened salts of silver, made with nitrate silver 2 parts, salt 2 parts, cream of tartar 14 parts, pulverize and mix. The black-leaded surface can be silvered by cleaning off the black lead.

(5369) W. W. S. says: 1. Up to the present time how many people have attended the World's Fair according to the tickets sold? A. To August 28, the number of paid admissions has been 9,529,332. 2. About how many people attend the World's Fair every day on an average? A. From 105,000 to 160,000; the average is probably 120,000 each. Sunday pulls down the general average. 3. If you were going to guess on

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the number of people that will attend the World's Fair while it is open, what would be one of your guesses? A. 15,000,000 to 16,000,000.

(5370) J. T. S. writes: Will you please let me know of a preparation for cleaning brass? A. Oxalic acid dissolved in water and mixed to a paste with any polishing, as tripoli, rotten stone or rouge. See "Scientific American Cyclopedia of Receipts" for several pages of polishing receipts, $5 mailed.

(5371) A. E. T.—Wind your field magnet and armature with No. 24 wire. We do not think the motor you are making will answer for clock winding, because it has dead centers and will not start. It will be better for you to make a three-pole armature, or better yet, to make a small machine like that described in SUPPLEMENT, No. 783.

(5372) W. H.—You can make a dynamo to furnish 20 volts by following the instructions given in SUPPLEMENT, No. 600, except as to the winding of the armature. You will need to wind the armature with No. 16 wire. If you desire to make a smaller dynamo for that voltage, make it two-thirds the dimensions given in the article referred to, using the same winding.

(5373) L. L. H.—The shape of the waist of the field magnet is practically immaterial; there is, however, a slight advantage in using a cylindrical field magnet, as that form permits of using the shortest length of wire for a given number of ampere turns.

(5374) B. H. C. writes: I wish you would answer W. H. C.'s question (5282), issue of August 19, more explicitly. Why are nails called penny, as three penny, four penny, etc.? A. The term penny, when used to mark the size of nails, is supposed to be a corruption of pound. Thus a 3 penny nail was such that 1,000 of them weighed 3 pounds, a 4 penny such that 1,000 weighed 4 pounds, and so on.

(5375) E. W. H.—To cure body lice use mercurial ointment.

(5376) W. H. D. asks: 1. The proper mixture to make of air and 74° gasoline to get the greatest force from explosion. A. For 1 part by weight of naphtha of 0·74 sp. gr. use 20 parts of air. This gives about 1 fluid ounce of naphtha for 2,000 cubic inches of air. 2. Why will a gasoline engine work stronger using gasoline than using manufactured gas? A. Gasoline for a given bulk has higher heating power than common gas. 3. What is the cost of an ordinary hydrometer? A. 25 cents upward. 4. Where can a glass boiler be procured, such as are used for showing steam currents, etc? A. Address our advertisers dealing in scientific instruments. 5. Why is there such a great difference between the indicated and the actual horse power of gasoline engines, and what is the cost of operating these engines with gasoline at 15 cents per gallon? A. No real indicated horse power for a gas engine is used in rating; the stated figure is arbitrary, hence the difference arises. For cost of operating address the manufacturers.

TO INVENTORS.

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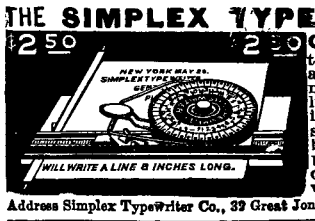

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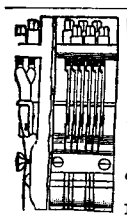

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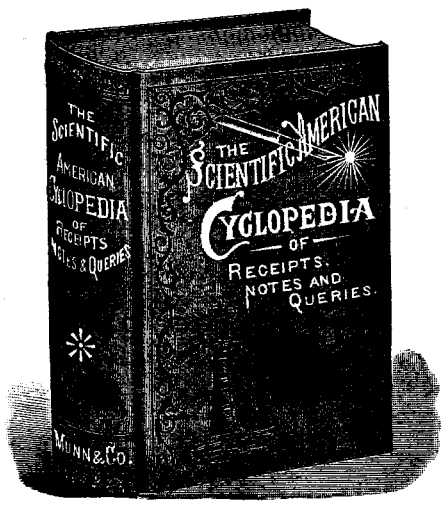

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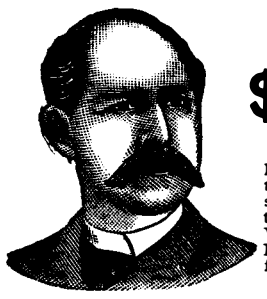

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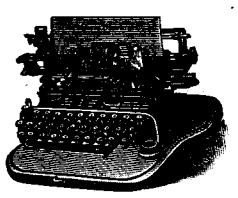

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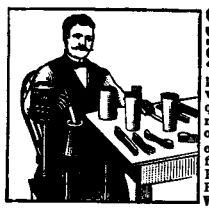

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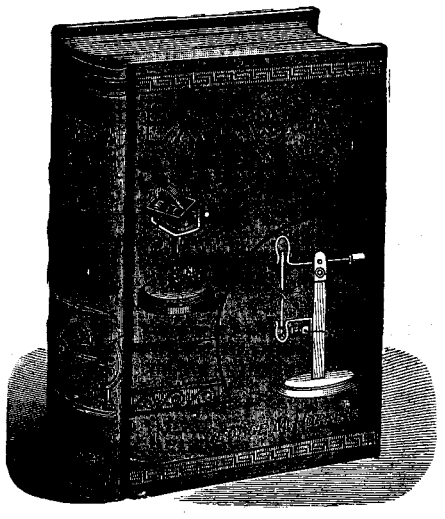

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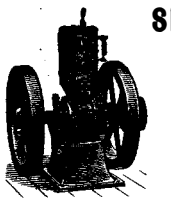

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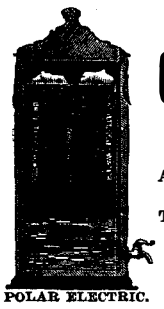

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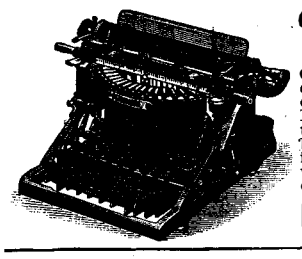

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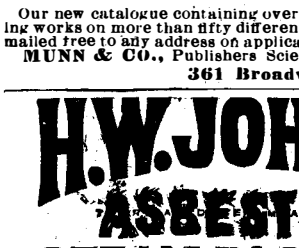

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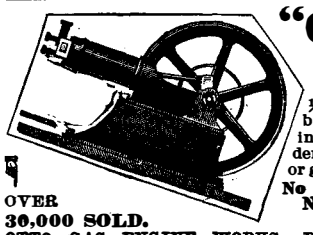

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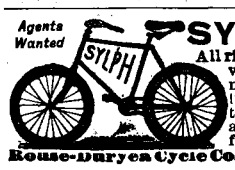

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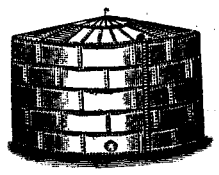

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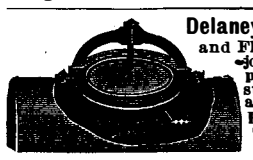

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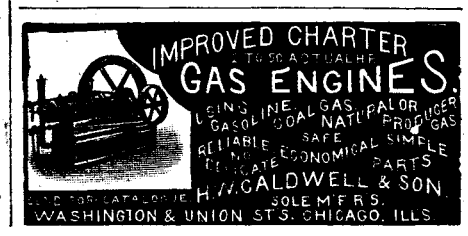

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